AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVII NEW YORK—THURSDAY, NOVEMBER 29, 1917—CHICAGO No. 22

Situation Much Easier in Washington

Apparently No Further Restrictions Are Planned—Detroit Production Picking Up—Railroad Conditions Not Bad

WASHINGTON, D. C., Nov. 26—The automobile situation insofar as concerns curtailment due to shortage of alloy steel or other materials, or further priority orders with regard to materials for the industry, is in a considerably easier position than a week ago. The announcement of Judge Lovett, Administrator of the Priorities Transportation Act, to the effect that rumors of further curtailment t othe industry are untrue is reassuring. This means that apparently no restrictions are contemplated in addition to Priority order No. 2, which prohibited the use of open-top freight cars for the transportation of automobiles and parts for passenger cars. The automobile industry is a unit in according the entire use of these cars to coal movement, which is not by any means in a satisfactory condition to-day.

Steel Situation Much Relieved

The steel situation has been relieved materially during the week, not by any official announcements but rather by definite statements that have circulated through official Washington. The most important one is that it is now admitted on many hands that the order restricting shipment of alloy steels to passenger automobile factories was never intended to have been given out. Through some channel or other it was given out, and it is only after the automobile industry has drawn attention to the alloy steel situation that the explanation to the effect that the restricting order should never have gone out has been forthcoming.

Manufacturing Situation Easier

The automobile manufacturing situation in the Detroit zone is considerably easier than it was a week ago. Manufacturers of assembled cars are holding up much better during the last 10 days than previous to that time. Reports show that several of the largest producing factories are running at 70 per cent normal. Dodge Brothers are still behind in orders. Ford produced 3000 cars one day last week, which is a high-water mark for that company. Reports from Buick, Cadillac, Oakland, Reo and others show that conditions are building up.

The extent to which many makers can continue production on a minimum of alloy steel is most assuring to the industry. Several makers have practically turned over to a high carbon steel basis except for a few parts on their cars so that the percentage of alloy steel essential is so small as not to be a factor to be considered in any curtailment program.

Considerable difference of opinion exists regarding the alloy situation. One large producer of alloy steel in this city last week admitted that he was

operating at 60 per cent capacity and is very glad to have obtained an order of considerable magnitude for alloy steel a week previous. If it were possible to get reliable information from many other alloy steel producers there might be some illuminating sidelights on the situation.

Officials More Reasonable

In many quarters official Washington is backing up somewhat in its talk of non-essentials. Many are finding it more difficult to define a non-essential than they imagined 3 weeks ago. There still is a great amount of apparently determined concert of action in many publicity channels to place the automobile industry before the public as a non-essential and to dwell on the fact that it might be curtailed, rather than to place before the public the facts of the steel situation which precipitated the matter of discussed curtailment at the outset.

Ninety per cent of the stories emanating from Washington apparently do not take recognition of the fact that with the majority of large producers the output is already 30 per cent curtailed. With others the curtailment is 50 per cent and with some smaller concerns it is to-day as great as 65 per cent and in some cases nearly 70 per cent.

It is unfortunate that so much government publicity only talks curtailment figures. It would be more constructive to the industry if recognition were taken of the normal reduction which to a very great extent represents the non-essential in the industry and which has automatically been taken care of. Throughout the country some daily papers continue apparently to wish to distort the facts. One large Eastern daily this week has carried a display head on a Washington story regarding the industry in which the display head carries exactly the opposite impression to that given in the story.

The story speaks favorably of the industry mentioning the fact that there is no necessity for curtailment, but the display head mentions that curtailment is necessary.

Judge Lovett's Statement

Judge Lovett in his official statement says:

"The report that I am contemplating an order shutting off railroad cars from the automobile industry is without any foundation in fact. I said a week ago that I did not have in mind any transportation order treating any industry as non-essential, since Priority Order No. 2 went as far as it seemed to me wise to do in dealing with so-called non-essentials by transportation orders. That statement still stands." (Priority No. 2 enforced Nov. 1 forbade the use of open-top freight cars for shipment of automiles or materials entering into them, furniture, pianos, road-building material and material for theaters and other buildings for amusement.)

The presentation of the automobile industry in Washington continues much as in the past. Perhaps a friendly criticism might be injected, suggesting still closer co-operation between the various committees representing automobile interests in the Capitol.

One of the easiest criticisms to make in Washington is that there is a multiplicity of committees and a lack of co-operation among these committees. It is only human nature that such a condition should exist.

There is too much competition among committees and not enough co-operation.

In this connection co-operation is the thing required between the Automobile Industries Committee and the Automotive Products Section of the Council of National Defense. This latter committee was designated by the War Industries Board as its representative on all matters relating to automotive apparatus and was especially appointed to act as a go-between for the Automobile Committee.

In place of this plan, however, the recent events display the committee disregarding the Automotive Products section in some matters, and despite the fact that the section expended much energy to secure Judge Lovett's statement, the committee also takes upon itself full credit for that.

Committee Working for Betterment of Industry

This does not mean that the Automobile Industries Committee is not working to its utmost ability. It is. It is conscientiously devoting its best energies for the betterment of the industry, though possibly not so wisely as might be. The committee seems to have a different impression of its chief duties from the public impression.

According to A. W. Copland, chairman, "It is formed primarily to make the automobile industry useful to the government in war work," while a general outside impression is that the commimttee, while aiding the government in war work, is primarily formed to aid the industry against unfair curtailment.

On the other hand, and against the obvious lack of co-operation referred to, there has been a spirit of co-operation and friendliness and a willingness to accept judgment displayed by parties representing the industry, both officially and unofficially, with members of the Council of National Defense who really should be regarded with a certain amount of reserve and caution until those parties who create the misleading publicity regarding the industry become known. For example, the recommendation of Council members not in any way connected with the industry was accepted by parties representing the automobile industry in the matter of appointment of an important Council member last week. Until the enemies of the industry are known, such recommendations should be taken reservedly.

And so far as regards the automobile and freight car situation, even this may be regarded with lessened fear if we recall the fact that the industry has ofen faced this problem in varied forms before

and escaped it. The steel production of the nation is about 90,000,000 tons a year. Of this the industry requires only about 1,250,000 tons. And if the freight car situation does become so critical that the industry must suffer curtailment of freight facilities, a condition that does not appear probable, it can always, with trucks and other means, solve the problem, much as it did with the drive-aways of last winter.

In other words, the constant reports telling of total curtailment of the passenger car industry might always be taken with a grain of reserve. The automobile industry in the United States is not the automobile industry of England. It is not a small, insignificant, helpless industry. It is the third largest industry of the nation—and with its great facilities it can always, if treated with just consideration, work its way out of any difficulties that may arise through this war.

The War Industries Board should be told of this viewpoint if the occasion demands. It should be informed if the time comes when the nation really needs every freight car for war purposes that freight car curtailment should not necessarily mean steel curtailment, and that the industry will find another means for transporting its steel. It should receive the aid of the industry in a positive way rather than in a negative manner.

At this time it does not appear as if there will be any direct and equal curtailment of the automobile industry, according to the Automobile Industries Committee, which believes that the War Industries Board will instead allow all manufacturers who desire to take up their slack business with war contracts providing they have the facilities—and also providing there are munitions to be made, for now comes the astonishing statement that despite all the recent publicity to the effect that the automobile industry must convert its facilities to munitions work to save the nation, practically all contracts are already placed outside of the industry and only a few remain to be let—additional evidence of the fallacies of the publicity frequently appearing in the press of the country.

One of the fortunate events of the week was the refusal of a large parts maker, already in Government service, to accept a position in the Council of National Defense as a member of the board which will deal especially with war industry problems, and which is soon to be formed as announced last week. This individual gives as his excuse his already extensive duties, but it is suspected that he wisely preferred to have no connection with a committee dealing with industry curtailment and which would certainly prove embarrassing if at a later time curtailment of the industry with which he is connected would be broached.

Pooling of Railroads Regarded Favorably

Pooling of the railroad facilities from Chicago eastward to the coast is regarded as a particularly wise movement and it is anticipated that the operating committee of vice-presidents of the various roads will arrive at an agreement for elimination of parallel and duplicate service, and for classification of high-class freight and low-class freight without much difficulty.

If, however, the committee does not arrive at a solution it is hinted here that the Government will appoint a transportation dictator with power to set aside hampering influences and run the railroads, combining pooling of revenue as well as equipment. Methods such as these combined with the rapidly increasing output of locomotives and freight cars will soon put an end to the transportation problems, and will prove more profitable to the nation than any hasty curtailment of industries.

The Automobile Industries Committee, now employing four industrial engineers, will soon have a complete staff allowing one or two engineers for cooperation with every department of the Government interested in munitions that can be supplied by the automobile industry.

Makers Invited to Bid

Blueprints and specifications showing war needs are on display at the committee's offices and all manufacturers are invited to examine these and if they feel themselves capable of producing the munitions required will be taken to the proper department by the committee.

Assembly contracts for the class B war trucks have not yet been placed and probably will not be for another fifteen days. Contracts for sample parts for the three sample class A war trucks which will be assembled by Dec. 10 were placed last week.

High Speed Trucks

EXPERIMENTS made thus far on heavy duty trucks equipped with pneumatic tires predict a revolution in truck design. To-day trucks are running regularly between Akron and Boston, carrying casings and tubes, and making the trip in less than express time. On one trip a tractor and semi-trailer was used, mounted on pneumatic cord tires throughout. The front tires were 40 x 8 in.; the drivers, 44 x 10 in.; and the rear tires, 48 x 12 in. And tires up to 54 x 15 in. are commercially possible.

It is not possible to make a high-speed heavy duty truck by simply mounting it on special pneumatic tires. The higher car speeds necessitate a larger engine, and because of the suspension, a lighter frame may be used. At present, trucks are designed for conditions that they meet only 10 per cent of the time, and hence lose in efficiency.

The pneumatic-tired truck will be designed with a more flexible transmission that willl permit operation at high car speeds and low engine speeds on good roads, and at low car speeds and high engine speeds on poor roads, in both instances on full throttle.

No Anxiety on Alloy Steel Account

Manufacturers Can Reduce Requirements for War Time Automobile Production to Less Than 1 Per Cent of Nation's Output—Some Companies Have Already Cut Per Chassis Requirements 70 Per Cent

DETROIT, Nov. 24—The automobile industry, if it had to, could manage with so little alloy steel that it would not have any trouble getting it. Normally, it would require 75 tons of alloy steel per 1000 cars produced. Cars of almost equal quality can be produced with 23 tons or less of alloy steel per 1000 cars.

The three main parts of the car where alloys are practically indispensable are the clashing gears in the gearbox, the torsional members in the rear axle and the balls used in ball bearings. The other transmission gears could be made of high carbon steel and, if the heat treatments were carefully worked out and held to close limits, the gears would be just as good and last nearly as long as the chrome-nickel gears now employed. The gears which have to endure shock, however, should be made of chrome steel, although even these can be produced satisfactorily by metallurgists from carbon steel.

Every automobile company threatened by shortage of alloy steel has been busy on the question of the possibility of dispensing with alloy steel. The Cadillac company, if it had to, could reduce the alloy steels to 75 or 100 lb. to a chassis. This is true with Buick and the other companies in the General Motors group, where the metallurgical matters are handled through a central staff.

Hudson Reduces 60 Per Cent

Hudson has reduced the necessary amount of alloy steel in the car by more than 60 per cent, so that if a real shortage should come there need not be more than 100 lb. of alloy steel in the Hudson chassis.

Oldsmobile can use carbon steel in place of alloy steel if the supply of alloying substances is cut off. The engine valves would be made from cast iron in place of tungsten steel, and though requiring more frequent grinding, results which are practically as good would be obtained.

Oakland could dispense with tungsten steel for valves and would have to find a substitute for vanadium to take care of the roller bearings, but this problem has been practically solved by the bearing manufacturers themselves.

Many of these companies and others have on hand a good supply of alloy steel which can be stretched over a very prolonged period in case of necessity. Other concerns also have not even begun to worry about the shortage of alloy steel. The King company has enough for next year's production. Cadillac is well fixed and is not worrying about a shortage.

The valve question could be readily solved by the cast-iron head and carbon steel stem. On the other hand, the axle shafts are difficult. The torsional stresses on these are hard to meet with the carbon steels. There is no doubt that in a case of real shortage, the axle members could be redesigned, possibly with tubular construction, so as to eliminate the necessity for alloy steel here.

If the automobile industry uses only 5 per cent of the alloy steels in peace time with large production, it will only use normally 2½ per cent with production 50 per cent off. If it can cut this amount down 70 per cent, which leading engineers say is entirely possible, it will mean that the automobile industry will only require seven-tenths of 1 per cent of the alloy steel output of this country to make good cars. This amount can readily be spared to an industry so essential to the welfare of the country.

Great Possibilities for Carbon Steel

By careful heat treatment there are possibilities in carbon steel that have been undreamed of in the past. A shortage of alloy steel, which permits of a wider latitude in the treatment of steel, would probably result in a great improvement in the handling of carbon steel.

The Ford company uses 300,000 tons of alloy steel a year in its present product, or about 30 lb. to the car. A large percentage of the steel used in the Ford car is vanadium steel, yet the amount of ferrovanadium used in a car would not make a lump as large as a man's finger, since by chemical analysis the percentage of vanadium is .15 or between 1/6 and 1/7 of 1 per cent.

Chrome nickel steel for the meshing or clashing gears and nickel steel for the rear axle shafts are the two most essential alloy steel products in the passenger chassis. It would take but a small fraction of 1 per cent of all the alloy steel output of the country to supply the automobile industry with these, and therefore, taken as a whole, the automobile industry needs not be very much worried about the alloy steel situation.

Quite a large proportion of manufacturers, especially makers of parts, have a good stock of chrome steel on hand and still more nickel steel. In many cases it is reported that large plants could continue running for three months or more on the stock in hand. This means that by changing the material so as to economize the more precious alloys operation could be maintained for perhaps a year.

In the stock parts field the engine builders can manage without any chrome, and with very little nickel; in fact, many of them use carbon steel almost exclusively already and have been doing this for some time past. The transmission manufacturers are not so fortunate, for they can hardly manage without from 20 to 50 gross pounds of nickel steel per gear-set, though they need not have chrome. Much the same applies to axle makers, who need something more than a plain case-hardening steel for bevel pinions and differentials as well as for the driveshafts already mentioned.

It is a fortunate thing that the need for alloy steel is least in the class of automobile for which there is the greatest need; that is in the medium-price and cheap car. It is, in a broad way, true that the makers of very high-grade cars which are essentially luxurious vehicles have suffered greater loss of business since the war than manufacturers of cars below the $2,000 price mark. The wealthy farmer may keep a fine car among several, but will commonly use something cheaper for his daily transportation. In the cheaper cars the weight is not cut so fine; the factors of safety remain sufficient if the material is of slightly lower tensile strength.

Thus while a shortage of chrome steel will be an inconvenience to the passenger-car manufacturers it is now obvious that it will be nothing more. There is even a possibility that we shall find we have been extravagant with costly alloys. Some manufacturers have for a long time made a study of the use of straight carbon steel, substituting careful heat treatment for alloy material. They have done well with the cheaper steel and it may be that others will find they have used alloys where they could have saved something by substituting carbon steel.

Standard Gasoline for Aircraft

Committee Appointed to Draft Specifications for Standard Fuel to Be Used by All the Allies' Air Services

WASHINGTON, Nov. 27—A standard grade of gasoline for use in the aviation engines of all the allies was decided upon here last week at a meeting at which engineering representatives of England, France, Italy and the United States were present. The plan is to specify a new brand of gasoline for airplane use which will be a world standard. The particular grade to be adopted does not exist, but gasoline engineers are setting to work on the job and in a short time there will be evolved this new standard that will be used in all planes of the allies.

This action was arrived at due to the severer conditions to be met with by airplane engines as compared with motor cars, trucks, motorcycles and motorboats. The airplane encounters in any flight practically all possible ranges of temperature and pressure. To meet this a special fuel is needed. The new fuel is to be developed by the Bureau of Standards of this city, the Bureau of Mines, the Signal Corps and the Society of Automotive Engineers. All are to co-operate in carrying out investigations along lines laid down at the meeting.

At present the allies are using ten different grades of gasoline for airplane engines, which is a disturbing factor not only on the battle front but also with the refiners, who have to make different grades, and to the transport departments and storage departments, that have to handle ten grades instead of one standard grade. The development of the standard airplane gasoline will be a big efficiency step and is but one more example of that necessary co-operation in winning this war that is taking place between France, England, Italy and the United States.

The standard gasoline, according to specifications laid down, will be a better fuel than used in automobiles today. The limiting factors of the new fuel were decided upon. The new standard gasoline will have a lower end point, perhaps 100 deg. Fahr. lower than many motor car fuels, and will also have a lower starting point. The percentage of volatility throughout the fuel will be greater than in present gasoline grades. The new gasoline will be such as to get the maximum quantity out of a gallon of crude oil, and yet give the lowest possible end point on the curve.

The development work will be carried out in the depression room of the Bureau of Standards, where it is possible to obtain practically the same atmospheric conditions as met by the airplane from the time it leaves sea level and rises to 22,000 feet altitude. In this room the air can be exhausted so as to give a mixture similar to that obtained at 15,000 feet or higher. Cold conditions equal to any temperature can be had at the same time.

This is the first time on record when engineers have set out to design a fuel to meet given conditions. The problems of lubrication under all conditions will be considered in conjunction with the work.

Dr. Durand, chairman of the Research Council of Aeronautics, presided, and among those present were Capt. Pearson of the British Navy; Capt. Chablon of the French Flying Corps; Lieut. F. Bizanni of the Italian Royal Flying Corps; H. L. Horning, chairman of the Automotive Products Section of the Council of National Defense; C. Narramore, petroleum technologist of the Bureau of Mines; Dr. C. P. Dickinson of the Bureau of Standards; Dr. Dean of the Bureau of Mines; Wahner of the Bureau of Standards; Parish of the Signal Corps; Lieut. Col. Wright of the navy; Diffin representing the Aircraft Production Board.

Four Passenger Town Car Design

Horse Carriage Lines Copied from Brougham Utilized in Ultra Modern Styles

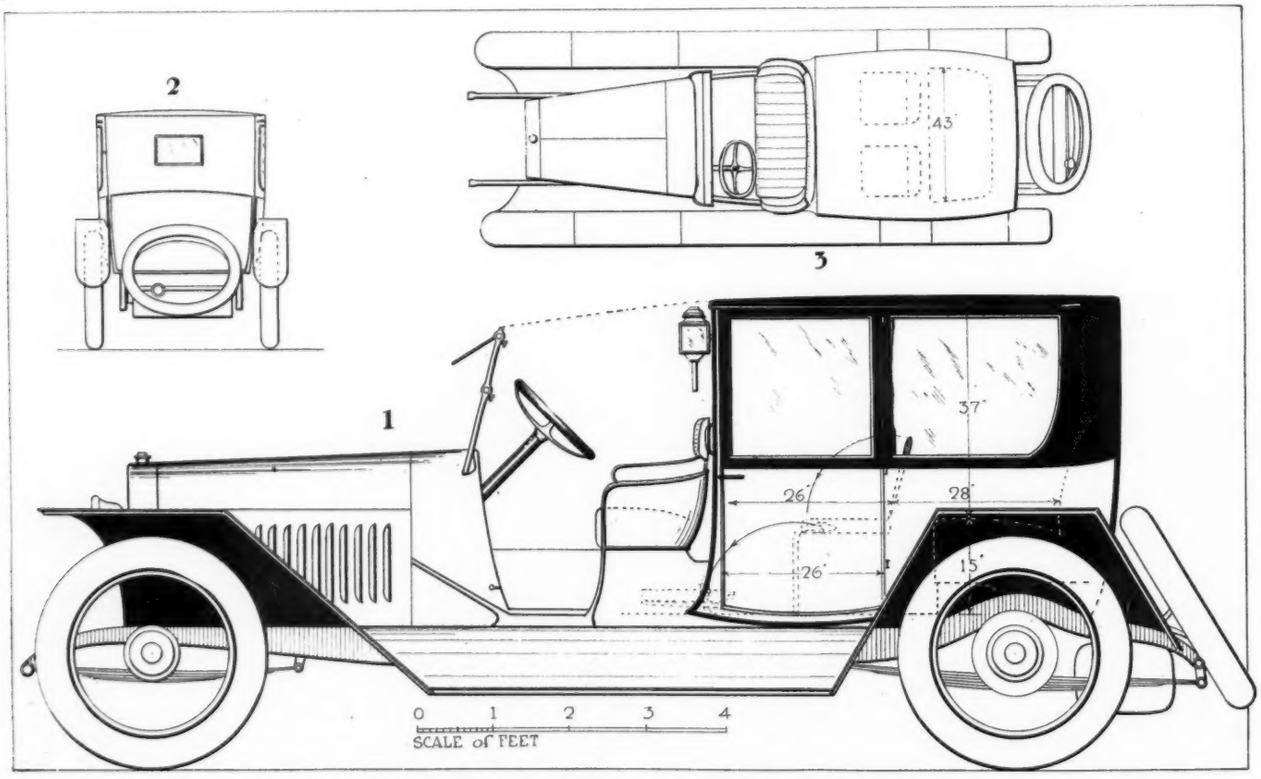
By George M. Mercer

THE design for a town car illustrated is one having seating inside for four persons, the body being narrow to allow all the side windows to drop flush. The chassis may be any standard make, since the shape of the radiator and hood does not enter so much into this body design as it would with another type. Here it is divorced from the body and the driver's seat is separate; consequently the cowl should have the shape that will conform with the hood, the only consideration being that it should be high, so as to give the impression of the hood and cowl coming well up and shielding the front seat. When the front of the car is high it makes the body look low. It is a pleasant task to begin the designing of a body on a chassis where a generous height is already established for the radiator and hood, because part of the difficulties of making good connections between the body and hood are at once overcome. On the design illustrated, the cowl top is rounded in continuation of the hood line and continues to the chasses line, being set off with a casting riveted to the metal sheet, this casting being a reproduction of the duster finish that was used before the advent of fore doors. It accentuates the individual seat. Low fore doors between the seat body and cowl are shown hinged at the front; these are detachable and can be taken off in warm weather.

The driver's seat is like that used on a horse carriage and is placed on an underbody that is finished at the top rear with what in the brougham was termed a neck panel with Peters lines. The body is square cornered at the rear and the window openings are made to match; the body is, in fact, a replica of the brougham, with the exception that it has a rear quarter window and, of course, is much larger. The roof line is straight and the crown of the top, as indicated on Fig. 2, is made to be as inconspicuous as possible from the side.

This body is made to duplicate the appearance of the wood panel job, but it is not advisable to use wood panels; no doubt but that a wood panel body will serve the purpose and wear well, provided that the care given to it was proportionately greater than what the average car body receives, but the extra time that a wood body requires for painting is one of the greatest drawbacks to its use, therefore on high class bodies, built in shops where modern facilities are at hand, these bodies are made of sheet aluminum panels over wood framing. The panels should be put on so as to conceal the joints, the roof panel being welded to the top edge of the side panels. Made in this way there are no joints to open up in use, as would be the case with wood panels, and the criticism of the metal roof panel permitting a hum inside due to the belling of the metal, thereby creating a synchronism of sound, can be overcome by packing with a deadener of felt between the metal roof and the wood bows on which it rests. This unpleasant sounding inside, due to being entirely encased in metal, is the reason that many builders use a leather roof.

To make the description ample, three views are shown.



Four-passenger town car design to suit any moderate-sized chassis

Fig. 1 is the side elevation, 2 the rear view, and 3 the view looking down from the top. The two latter are in miniature, but they clarify the natural desire to know what the appearance is from these angles. Looking at Fig. 2, it is apparent that the extreme width is only slightly greater than the inside of the guard, and there is no wheel house. There is a slight depression in the side panels under the guards to give safe wheel clearance, and the guards are cut into from the inside for the body curve, but there is no actual wheel pocket. This will permit the glass dropping to its full length, something that everyone wants, but which is only possible when the body is narrow and the seat width can be sacrificed to obtain this result.

The seat room inside is for four adults, two on the folding and two on the rear seat. The folding seats are made to disappear under the driving seat when not in use, as illustrated on Fig. 1.

The miniature views, Figs. 2 and 3, are one-half the size of Fig. 1. Dimensions are given for the most important measurements only, such as the entrance room at the doors, the width, and height of the cushions, the head room and the distance between the seats and the division. No body is right unless the measurements of the seating accommodation are right, and a customer should verify these to his own satisfaction before having the body constructed; if there is not another body at hand for comparison, then a stool or chair can be used, locating this with some overhead object for the height and with the wall for the distance back and front. Everyone that desires to have a body built should check these dimensions with the bodybuilder and satisfy themselves at first hand, so that when the job is turned out it will be what they have in mind, or they will know beforehand that their ideas must be modified to conform to practical conditions.

Head Room Variation

The head room is very important; the average body is made for the average person. This can be shaded to suit a short person or one who wants the seat set close to the floor. There is a possible variation of 5 in. between the maximum and minimum heights. The height of the cushion from the floor can be varied, the average now being 3 in. less than formerly. The height of the cushion from the floor cannot be taken independently from the depth of the cushion from back to front, which varies from 18 to 22 in. The height must be low, about 12 in. at the front will allow the passenger to sit against the back and be comfortable. The height of a seat back should be 21 in. above the cushion on a rear seat.

The folding seat always has been, and probably always will be, a problem both for the owner and the builder. In no case should a seat of this description be put in a body where the distance forward to the partition is less than 24 in. and the distance from the back to the seat roll of the rear seat less than 25 in. It will be noted in Fig. 1 that the dimensions are greater than this.

It will also be noted that the dimensions are given from the point where the back rests to the point where the knees may come in contact. The depth of the seat cushion is a minor matter that can always be regulated. What directly affects the user is the total distance that is allowed for his body to occupy. Another thing that enters into the space allowed for the small seat is the provision for the toes to be forward of the actual distance allowed for the knees. In this case the toes will enter the compartment provided for the seats to fold into.

This pocket under the driving seat will cut off some of the length of the drop of the front light, but the distance will permit of the light dropping to the top of the driving seat back.

Angular Fenders

The guards are angular; guards like this have been used for some time on runabouts and touring cars, but not often on closed jobs, but the wish of the public is for novelty and, as about every type of round and curved guards may be used, the flat and angular are coming in for a limited amount of attention. They have the distinction at least of being unusual. They can only be used when the rear door is wide, because the bottom of the guard, where it meets the running board, is further forward than ordinary and, unless the door is wide, the tendency is to step on the guard on getting out.

The extra tire is placed at the rear at an angle that blends with the guard line; the windshield is slanting at an angle of 17 deg. from the perpendicular, and is on top of the cowl. The dotted line from the top of the windshield to the body shows the line of the storm roof curtain when in place. Pillar lamps and grab handles are also used; at the present time town bodies more often are without them than with, but in the present design they carry out the carriage lines and make the car look complete.

A suitable color for the painting would be black, with either a dark or medium light green, or in place of the green either a blue or maroon; the black used on the guards and the entire upper panel above the belt and the body mouldings, the other color for the balance of the body and the running gear. A light black stripe is also in order here. The windshield is black and the lamps, door handles and grab handles are either black or silver.

Trimming materials are of such variety that they are more easily chosen from the sample books than described. This is a large body and the appearance when finished should be one that suggests durability rather than exquisiteness. The cloth must have good wearing qualities, but be light in color. Either a broadcloth or small figure or stripe, with carpet, curtains and laprobe to match, is good when the markings in the material are prominent. In such case it is best to have plain material above the waistline on the sides, back and the roof. A carpet foot pillow is preferable for a foot rest, the curtains with spring rollers, and all windows should have a regulator. The dome and reading lights should be silver finish, inconspicuous design, and the reading lights flush, but not concealed.

—

"Inside Information"

THE writer had occasion recently to go to an automobile manufacturing town near Detroit, and he started a conversation with one of his fellow passengers—a workman lately discharged from one of the automobile plants in the town who had been to Detroit hunting another job. This was the nest of rumors that man represented:

1—10,000 workmen had left the town in the past two weeks, having been discharged. Even the streets were deserted at night.

2—Plant No. 1 had reduced its output from 3000 per week to 1800 per week, and had laid off 40 per cent of its employees.

3—Plant No. 2 had laid off 50 per cent of its employees, and reduced its output to that extent.

4—Plant No. 3 was to close completely next week.

Though the writer knew this to be a misstatement, he knew there must be some facts behind the rumor. This is what he found:

That the normal output of Plant No. 1 was 180 cars per day, and that every day they are producing 160 cars—or 90 per cent of the normal production. Men had been released, but these were not the producers. They were the excess loading men, laborers and drive-away gangs. The plant is simply getting to a war basis, and producing cars.

The present daily labor turnover of Plant No. 2 is about 60 men; that number being discharged or quitting each day, and the same number being hired. At one time the foundry was closed for a short period, because of a temporary lack of material, but these men are now working. Exclusive of the freight shipments, from 150 to 175 cars are being driven away daily, materials are coming in well, and large government contracts have been secured. This plant is also getting onto a war basis, and though not discharging the good men, is cleaning out the inefficients, and holding its wage schedule constant.

For the past two weeks, Plant No. 3 has been conducting an inventory, but this has not interfered with the normal production to any extent. And this inventory is to be continued for another week. In the body department, from 40 to 50 men were laid off for 3 days, but these are all now back at work, and this company will have new models at the shows.

Safety Engineering in Automotive Plants

Causes of Accidents in Various Departments and How They May Be Minimized or Eliminated—Co-operation the Keynote of Safety Congress

EDITOR'S NOTE.—*In the present issue we begin the publication of a series of articles on problems of safety engineering in automotive manufacturing plants, based upon papers presented to and discussions conducted by the Automotive Section of the National Safety Council at the Safety Congress held in New York some months ago. While regular papers were read on some of the topics on the program, most of the latter were slated for discussion only. We have endeavored to extract the salient points from these discussions and to present them in condensed form. This makes it impracticable to credit every delegate to the Congress with his particular contributions. The men in attendance and who took part in the proceedings were: W. E. Williams, Packard; Robert A. Shaw, Ford; E. F. Lingemann, Hudson; D. R. Livingstone, Reo; C. A. Briggs and W. J. Higley, Willys-Overland; John Forbes and H. D. Christian, Willys-Morrow; Robert F. Coleman and W. H. Bayer, Pierce-Arrow; L. W. Leonard, J. W. Murray Mfg. Co.; J. R. Anderson, Insurance; W. H. Urquhart and Michael Barratt, Michigan Bolt & Nut Works; Philip Leihoff, Insurance; K. T. Cobb, Insurance; Frank D. Willis, Hoggson & Pettis Mfg. So.; F. J. Carrigan, Remington; James J. Lynch, Chevrolet; W. W. Roach and R. R. Ray, Dodge Brothers; W. B. Place, David Luptons Sons Company, and A. U. Barnes, F. A. Hardy & Co.*

Hazards in Sheet Metal Handling

Based on a Paper by R. R. Ray, Safety Engineer, Dodge Brothers

FOR the construction of most automobiles, especially those of the passenger type, sheet metal is used extensively, and naturally it presents a distinct hazard. Punch presses are the most hazardous department of an automobile plant. In that department, and in the sheet metal stores department, Dodge Brothers employ about 650 men, and while there are other departments equally large, the sheet metal and punch press departments head the list each month with the total number of accidents. For the most part these accidents are trivial. In the last six months there were 153 accidents in these departments, eleven of which were lost-time accidents. The accidents in these departments formed about 25 per cent of the total for that period.

Receiving Sheet Metal

The sheet metal comes to the factory in half a dozen different grades from the different mills and in different types of cars. It is unloaded from the cars into a large steel storeroom, a room about 100 by 400 ft. There are three cranes operating the full length of the building, which handle the metal. It is stacked in neat and orderly piles by means of specially designed slings. Three types of slings are used to handle all the sheet metal. The slings have been in use for more than three years and there have been only two cases where loads fell from the slings, no one being hurt in either instance. Of course, that was a matter of good fortune. The largest sized sheet handled is 47 by 114 in. and the gages range all the way from No. 22 up to ¼ in.

The sheet metal is piled in a neat and orderly manner. Of course, it presents a ragged edge, but efforts are made to secure sufficient aisleway; in fact, down through the main part of the room, where there is an industrial railway, there is all of 15 ft. aisle space, and in other parts of the room 6 or 8 ft. Occasionally accidents are caused by men running against corners of these sheet metal piles. It does not seem feasible to build guards around the piles, because they would have to be moved too often.

No trouble is experienced with the sheet metal as it lays flat, through the stock falling over, but as some of the piles are formed or as the sheets are being trucked about or stacked, occasionally they fall over owing to faulty piling. All this work has to be carefully supervised in order to safeguard against accidents of this character.

In the punch press department there are 118 presses ranging in capacity from a No. 2 Toledo to a No. 268 Toledo and a No. 80½ Bliss. As in most plants containing a large number of presses, they are arranged in series, so that a job is blanked out and passes on from press to press until it is completely formed, to avoid all unnecessary trucking. The presses, for the most part, are safeguarded and all the operators have pliers and sticks for inserting the sheets and for removing the stamped parts; they also have gloves for handling the rougher metal.

A great factor in preventing accidents in the sheet metal department has been a safety inspector who devotes his full time and attention to the press and sheet metal departments. This man has had a lot of experience and he understands thoroughly the operation of every type of punch press. It is his duty to instruct every new man who comes into the department about the different hazards of his job; as the jobs are changed on the presses he observes the manner in which the men work and sees that they perform their work carefully.

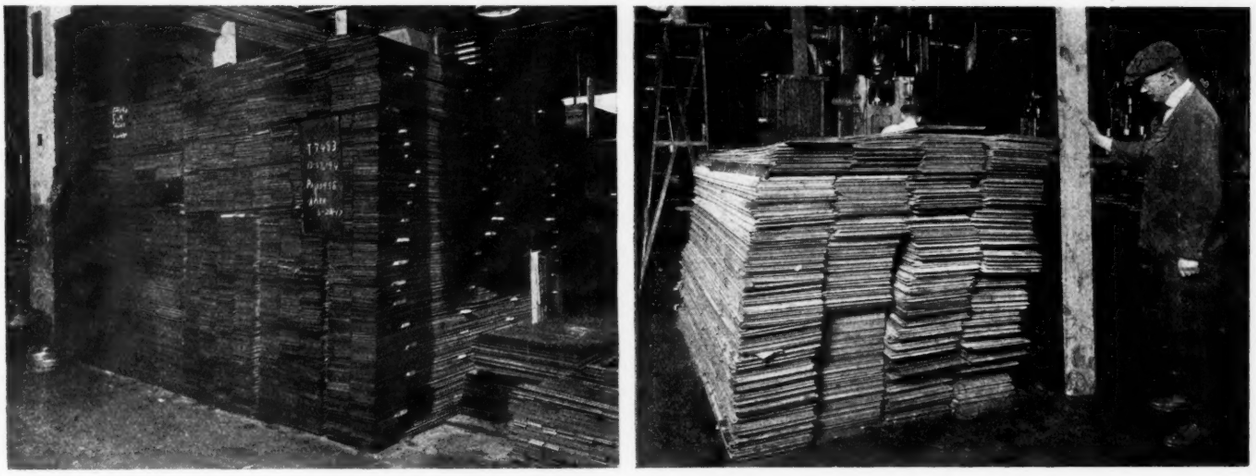
The removal of scrap from the presses presents the greatest hazard and is probably the source of the greatest number of accidents. At present the scrap is placed in large boxes mounted on jack-trucks. They are moved about under craneways where the scrap is picked up by magnets and transferred to cars. A great deal of it is shipped away. All the men who handle scrap wear gloves.

A number of the punch presses are provided with Jones' guards. It is not possible to guard every press, no guard having been designed as yet to take care of every sort of punch press job. Constant experiments are being made with the different types of guards produced, but nothing better has been found than the Jones guard, even though its use is limited.

The specially constructed pliers furnished to the men have been the means of preventing a number of accidents. The pliers are fashioned in a rough manner in the blacksmith department and every man having a dangerous job is provided with them. They are known to have been the means of preventing a lot of accidents, because hardly a week passes that two or three pairs that have been cut under the dies are not sent up to the safety department. About 150 night men are employed in the punch press department. Throughout the plant there are 2500 night workers and night work is considered by everybody to be more or less of a hazard. A night safety inspector is chosen from the punch press department. He is an experienced man and he devotes the major part of his time to that department.

Experiments have been made with different types of gloves for the workmen. It is a question whether it is advisable to furnish these gloves entirely free or to charge the workmen a small amount for them. Of course, there are arguments in favor of both methods and it would be interesting to hear the experience of other companies.

The new layout of presses in the Dodge plant may be of interest as it is expected to prevent accidents. Eight presses



The right and the wrong way of piling sheet metal (Ford)

are being arranged in a row, and at first all of the dies will be changed uniformly. That is, when a job comes through that calls for enough parts for 20,000 cars, all the dies will be set up for the job on the presses. First will come the blanking operation, then the work will go to the drawing press, then to the finished part, and it will then fall on a conveyor immediately back of the press and pass to a rotary furnace located behind the wall about eight or ten feet back of the press. It then goes through the furnace and falls out at the other end on another conveyor which takes it to the cooling tank located underneath the crane. Another conveyor from the cooling tank brings it back to the next press, where the next drawing operation is performed. The finished part again falls on a conveyor, and is taken to a furnace and then through a cooling tank. It is believed that this system is going to prevent accidents. As it is now, the different parts have to be trucked about a great deal, even though the presses are laid out as nearly as possible in a series. With the new type of construction the conveyors will take away all the scrap from the presses. So far the removal of the scrap has involved the greatest hazards.

One Pair of Gloves Each Day

Information has been requested with regard to the protection afforded by the distribution of gloves for handling sheet metal. Dodge Brothers made quite a lengthy study of the proposition about a year ago, and found that from twenty to twenty-four pairs of gloves were required for each man in the department per month. That was a very high figure. Half of the men in the department were welders, not strictly handling sheet metal, and the material came to them in all forms, ready for them to make up. The cost of such a large number of gloves was considerable and an attempt was made to remedy the situation. Several different types of gloves were secured, gloves with riveted metal palms, with composition palms, and with leather palms.

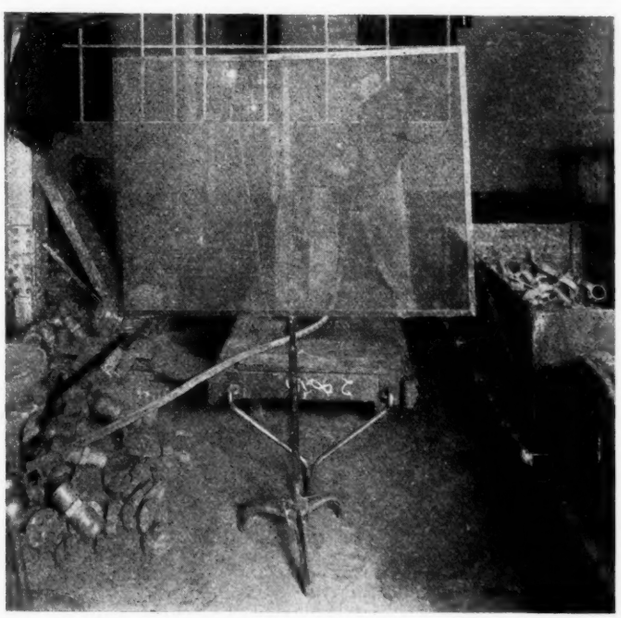
They were tried under different conditions in that department, both with the welders, who generally burn their gloves, and the sheet-metal handlers. It was finally decided that the tire men and the sheet-metal handlers should be the only workmen to receive gloves, and a change in the method of handing out gloves was made accordingly. Formerly a clerk could get a pair of gloves on the regular storehouse requisition. This was changed so the gloves for the whole department are now in personal charge of the foreman. The sheet-metal handler gets one pair of gloves daily, the gloves supplied being the cheapest on the market.

The reason for giving out one pair of gloves each day was that a man who could wear out a pair of these cheap gloves in a day was working on a job that required the use of gloves. The issuance of gloves was taken out of the storehouse keeper's hands and put into the hands of the sheet-metal department foreman because he knew all about the job, where a man was handling a press with ragged gloves, and whether he needed gloves or not. The entire proposition worked out very satisfactorily.

Slings and Magnets

As regard methods of handling sheet metal, Dodge Brothers experimented with slings and with electro-magnets and have come to the conclusion that the nearer you can keep the metal sheet to old Mother Earth the better—probably more so in the automobile industry than in others, because the gages run 12, 14 and 16. Most of the tanks are 12 and 14 gage.

Matthews traveling conveyors are used to carry the metal from the cars to the storehouses and men have only to handle the material in changing it from a truck to a revolvator. In some cases the latter can be used at the end of the Matthews carrier and it piles square sheets near enough to the exact part to be elevated without very much trouble. The large sheets—the 12 gage—are about 14 in. wide and 148 in. long and require about three men to lift them. They are let off a traveling conveyor onto a heavily constructed truck, that truck is pulled to the elevation, and the matter is put up to the revolvator or to the men. Slings place considerable responsibility on the safety man, in that they must be inspected or the metal will slip, resulting in accidents to the men handling them.



Guard used for chipping (Reo)

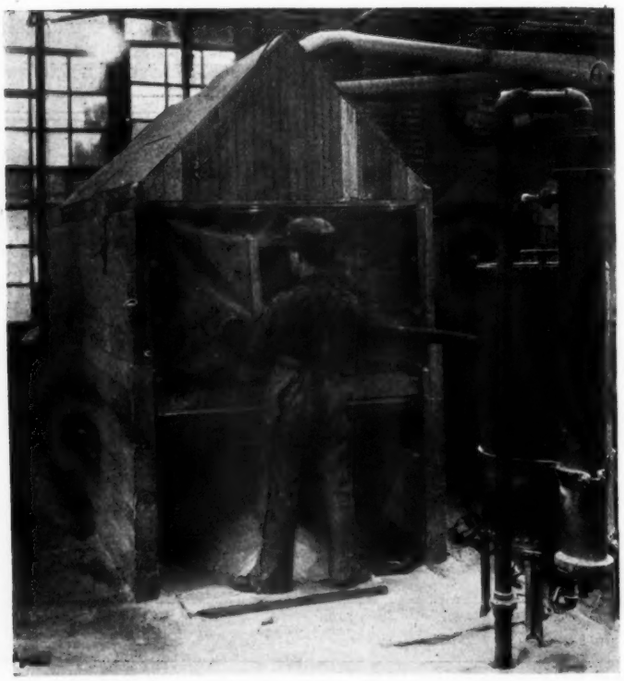
Reducing Hazards in Sand Blasting

ONE of the most hazardous occupations in the average manufacturing plant is that of the sand blaster. Under the old system of operation not only was the workman exposed to the fine dust mixed with the sand, which got into his lungs and caused lung trouble, but it would happen that the hose would get away from the operator, who was struck and possibly killed by it. Owing to the dangers to health in sand blasting it has been difficult to secure and hold men. The problem was discussed at one of the sessions of the Automotive Section at the recent National Safety Congress, and several improvements in sand blasting methods were described, which will safe-guard the lives of operators in this line of work.

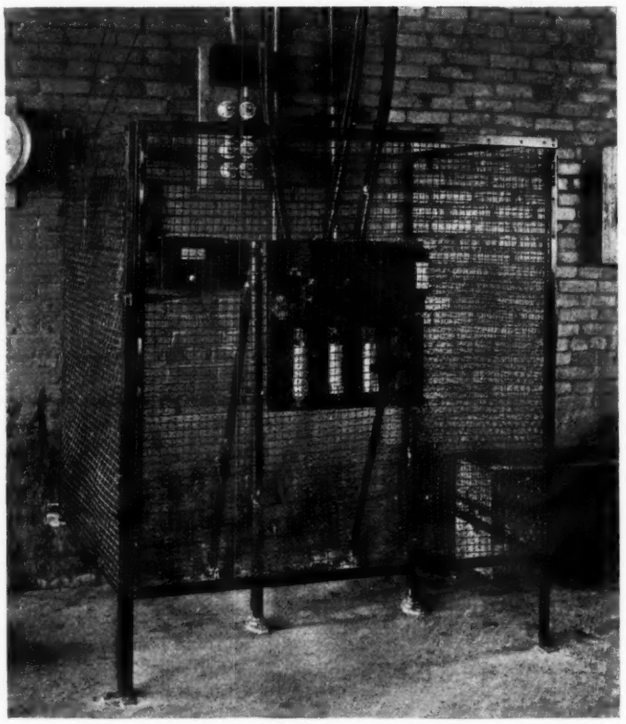
After a great many experiments the Cadillac Motor Car Co. put in an entirely new system. There is a sliding door in front of the confiner and an apron is swung around it. Fresh air is forced into the confiner, so that the operator is breathing fresh air all the time and not working in the dust. The sand needs not to be handled, but is used over and over and is finally carried away in the exhaust system. The men look at the work through a screen, of the same kind as has always been used, but this screen is made extra large and the current of the air cleans it, so that it cannot clog up with dust like the old type screen. Inside the booth there are two lights and the men can see the work better than with the old system.

The workmen wear helmets which form part of a one-piece suit. For the protection of the eyes glass or very fine screen is used, depending on how clean the floor is kept. The exhaust system draws the air out, but if any dust is mixed with the air it lodges on the workman's face and in order to keep him from breathing the dust he is provided with a respirator.

At the plant of the Willys-Morrow Co., Elmira, N. Y., where a great deal of sand blasting is done on small parts such as gears, there is a booth which is about 5 ft. sq. that goes up to the roof, and a suction system at the top takes out the fine dust. Down in front is a slanting window through which the workman can see his work. Underneath the window are two arm holes through which the work is put in. There are iron bars across the plate so that as the work proceeds the sand is carried through a conveyor. A man can stand in front of this booth and work without goggles.



Sandblast hood used for sandblasting small castings. This has a light inside. All dust is taken up by suction blowers placed in the top. The opening in the front is covered with heavy duck, in which there is a heavy glass, through which the man can see (Reo)



Type of guard used around the switchboard of a rotary electric enameling oven (Reo)

Sand blasting of bodies (instead of sand-papering) was introduced by the Packard Motor Co. about nine months ago. The man was put into a closed room which has a ventilating system such that there is a complete change of air every thirty seconds, whereby dust is eliminated to a certain extent. He was also provided with padded clothing and with a helmet to which is connected an air tube from an air washing system. Air is forced into the helmet under a pressure of 1 ounce per sq. in., the tube being fastened at the back and extending right to the top of the helmet. The air enters directly in front of the man's mouth, blowing downwards.

This system worked out very well, as is shown by the fact that not a man quit on this particular job for a period of nine months, whereas the men in the sand-blasting rooms in other parts of the factory have quit on an average of every three months for the past five years. The Packard company in one department of their plant use steel shot and in another department sand.

Attention was called by John G. Shirley of the Gilbert & Barker Mfg. Co. to the fact that the Pullman company sand blasts its complete car both inside and out. The problem is a particularly difficult one, as a railway car cannot be put into a cabinet, and as the scale is hard to remove, high pressure has to be used. Under the old plan a great many accidents were due to hoses getting away and even very strong men lost their lives by not playing the hose right. Mr. Shirley's firm has solved the lighting problem by removing the ordinary roof from the cabinet and putting in a glass roof, the glass being slid in strips placed across the cabinet.

Lead Poisoning in the Paint Shop

THERE have been quite a number of cases of lead poisoning in the automobile industry as a result of the use of the air brush in applying coats of paint to chassis and bodies. The Packard Motor Car Co., as reported by its safety engineer, W. E. Williams, at the Sixth Annual Safety Congress, formerly put a priming coat on under a large hood, which was

supposed to carry away the fumes and lead. However, one healthy man who was put on a job began to lose weight after having been at it for a little over two weeks, and finally he had to be taken to the hospital, where it was found that he suffered from lead poisoning. As a result the spraying method was discarded and the priming coat was again put on with the brush until the defect could be remedied.

As the entire chassis and body are sprayed it is not possible to cover the men up completely, as they could then not get around the car. Finally a helmet was adopted, as well as a respirator, the device being built right down to the floor in a separate room. The old exhaust system was torn out and another of five times the capacity installed. As the system has been in operation for only a few months it cannot yet be said with absolute certainty that lead poisoning has been eliminated.

There have also been cases of poisoning among the men employed in the painting department of the Gilbert & Barker Mfg. Co., who also spray their paint. The matter was brought very forcibly to the attention of the company because the state factory inspector reported it to the Bureau of Labor, which called upon the firm to remedy the conditions.

An expert on skin diseases was engaged and five cases were given to him. The doctor was unable to ascertain whether these were cases of lead, zinc or turpentine poisoning, but Mr. Shirley, who reported the matter to the Safety Congress, was of the opinion that they were turpentine poisoning, as it had been difficult to get first class turpentine and second class material was used. The men affected were transferred from the paint shop to the assembly machine shop and other departments, and were given periodical treatment by the expert to eliminate the rash which had broken out on their arms where their sleeves rolled up. Some of the men had their entire bodies covered with this rash. They could not sleep at night and consequently were of little use to the company during the day. By transferring the men to other departments and having the specialist treat them they were cured and went back to the paint shop. They have not been back long enough to tell whether they are immune against further attacks.

Every Saturday morning they are examined by the physician and the company hopes to collect some valuable information regarding poisoning and skin diseases contracted in paint shops.

Ventilation of Engine Test Rooms

IT is well known that when a gasoline engine is operated in a small, closed room, the gases given off have a very detrimental effect on human beings, causing severe headaches and even producing death. Of course, in engine test rooms the exhaust is always carried outside the room, but some of the burnt gases inevitably escape into the room and much trouble has been caused thereby. It is evident that where testing goes on continuously a very thorough system of ventilation is essential if the health of the attendants is not to be jeopardized. The subject was discussed at the sixth annual Safety Congress held in New York recently.

E. R. Livingstone, safety engineer of the Reo Motor Car Co., said that from their factory engineer's point of view their testing room system was the best in the state of Michigan. In this room large pipes, about 5 ft. in diameter, come down from the roof to within about 5 ft. of the floor. These pipes, which are distributed over the whole length of the room, carry in fresh air, and the gas from the exhaust is stirred up enough so that suction fans placed along the side wall remove it. The room is not at all smoky, and no trouble from headaches is experienced. Previously a suction system was used for ventilating the room, but it was not effective and a complaint was made by the employees.

The Packard Motor Car Co. had considerable trouble for a while with its block test system. In order to eliminate it, skylights were put in in each block test room. Now, each motor being tested under its own power is in a separate room, and the men in charge of the work disregarded the fact that gasoline vapor and the gases causing the trouble are heavier than air. When the mistake was realized an exhaust system was put in, extending through the entire series of rooms, with openings located 3 in. from the floor. The skylights, which were originally put in to permit of the escape of the noxious gases, now serve the purpose of admitting air.

The Wonder Engine

THE Elbridge Engine Co., Rochester, N. Y., are manufacturing a four-cylinder engine of the same cylinder dimensions as and interchangeable with the Ford engine. It is designed for use on passenger cars, trucks and tractors. The bore is 3¾ in. and the stroke 4 in., making the piston displacement 177 cu. in. Without the transmission the engine weighs 323 lb., all fittings being of iron. The upper half of the crankcase is cast integral with the cylinder block, and the lower half as well as the oil pan are iron castings. The flywheel is 14 in. in diameter and weighs 40 lb. Following are some of the more important outside dimensions of the engine: Height above bed rests, 11 in.; drop below bed rests, 13 in.; width between bolt hole centers, 20 in.; overall width, 21½ in.; overall length, 30 in.

Lubrication is by the circulating splash system, the oil being circulated by a plunger pump on the outside of the crankcase and driven from an eccentric on the camshaft. Cooling is by the thermo syphon system. It is stated that the engine can be run at any speed between 150 and 2500 r.p.m. Three-point suspension is used, and the engine fits into the Ford chassis. The bell housing is designed to take the standard transmission and the Bendix starter drive. This engine has already been adopted by manufacturers of light passenger cars, 1-ton trucks and small tractors.

The engine may be equipped with a carbureter of any standard make and with an Atwater Kent ignition system. A Gray & Davis starting and lighting system can be furnished as an extra at a moderate charge.

Mid-West Section Discusses Tractors

Need for Large Supply Emphasized—Must Burn Heavy Fuel—Aluminum Alloy Strength Subject of Separate Paper

CHICAGO, Nov. 23—At the meeting of the Mid-West section of the Society of Automotive Engineers, held at the Chicago Automobile Club last evening, S. W. Gurney, Gurney Ball Bearing Co., and F. A. Cravens, Advance-Rumley Co., read papers on tractor topics. H. T. Kramm, Kramm Foundry Co., also presented a paper on aluminum alloys.

S. W. Gurney's paper dealt with tractors in relation to the war and their vital necessity in order to maintain the required production of foodstuffs. Due to the war, millions have been transferred from productive to non-productive occupations, and to overcome the shortage of labor in agricultural regions tractors should be built in large quantities and of the best materials available. This is an urgent need to maintain the Allies' armed forces at the battle front.

The enduring type of tractor and its elemental principles of design was F. A. Craven's subject. Tractors should be designed on a liberal basis to insure long life, embodying simplicity, accessibility, and few working parts. The engine should be capable of burning low-grade fuel and use cheap lubricating oil to reduce its operating expense. The size of the tractor should be such that it could haul three or four plows with sufficient reserve power to enable it to handle unusual conditions.

Alloy Satisfactory Bearing Material

In his paper on aluminum alloys H. T. Kramm outlined briefly the experimental work that led to the development of malinum. The physical properties of the alloy make it very easy to machine, and the loss through breakage is reduced to a minimum. In casting pistons, etc., it is possible to control the hardness and thus insure equal wear of parts in all cases. This metal, as demonstrated by recent tests, has proved to be a very satisfactory bearing material. Its chemical composition is 90 per cent aluminum, 6 per cent copper and 4 per cent zinc. The tensile strength varies from 25,000 to 32,000 lb.

The trend of the tractor discussion was along lines of heavy fuels, plain bearings versus ball bearings, drawbar pull necessary per plow under normal conditions, and the ultimate type of tractor. Regarding the alloy, questions were asked concerning its properties, adaptability as a piston material, and the reduction of foundry and machine shop losses.

Craven's Paper

The salient points of F. A. Craven's paper are given in the following extracts:

"There is not at the present time a type of tractor which is generally accepted as standard design. Eight years, the life of the industry, has not been long enough for designers to accept the salient features of all the commercially successful machines and to combine them, as has been done in the automobile field. We have been told by experts in and out of the industry what the ultimate type of engine will be and what the tractor must do. In the meantime, the user must exercise the same amount of good judgment and mechanical knowledge as formerly he used his knowledge of horseflesh. Totally unskilled labor has no place in connection with the operation of any motive power. Be it horses or tractors, the unskilled man must quickly learn to care for them or they soon become a total loss.

"The factors which influence design at the present time are:

"1. The prohibitive cost of gasoline for field work. The scarcity and high price of skilled labor. The inability of manufacturers to secure certain materials either at all or in sufficient quantity, necessitating the substitution of others and modification of design.

"2. The ability of the farmer to pay more for a tractor than formerly, owing to the greatly increased prices received for his produce.

"The industry as a whole has suffered in the last three years by offering to the farmer many ill-digested implements of disappointment termed tractors by their sponsors. The largest concerns have been guilty with the lone inventor, indeed more so, having sold hundreds of an unsatisfactory design to the few of the small maker. Happily the immature efforts are being eliminated and a reversion to sounder and more conservative designs is to be noticed.

"Slow speed and large bearings are necessary to long life in the tractor engine. The stationary internal combustion engine is expected to deliver its rated horsepower continuously all day long, perhaps all night also. A tractor engine under proper working conditions is called upon for 75 per cent of its rated power continuously during operation and must deliver the remaining 25 per cent when needed to overcome obstructions.

Development of Motor

"The automobile motor leads a lazy life and in spite of occasional spurts, loafs through its average day's work called upon for only 20 per cent of its rated output, and that not by any means continuously. Early automobile engines with motors of one or two cylinders of slow speed gave place to the present practice of four, six and eight or even more cylinders in order and obtain greater flexibility, less weight per horsepower and less noisy operation.

"These reasons for change imperative in the development of the automobile should not influence the tractor designer. An engine of constant governed slow speed, few parts and freedom from frequent and delicate adjustments should be the aim.

"The experience of the last three years has proved that the useful size of tractor must handle three or more 14-in. plows, and another year will perhaps demonstrate that four plows is the more satisfactory minimum.

Four-Plow Outfit Favored

"The British Food Commission, handling the government end of the tractor business in the United Kingdom, inclines to the use of a four-plow outfit, these to be stationed in districts according to the amount of arable land and used for custom plowing. It is certain that a two-plow tractor traveling at horse speed will not relieve any shortage of labor. We may expect the individual user to arrive at the same conclusion as the centralized operating agency, only more slowly.

"A suggested range of sizes would be 20 hp., 3 plows; 30 hp., 4 plows; 40 hp., 6 plows, and 60 hp., 8 plows. The last size is limited in use for plowing, its great horsepower being used for operating the largest separators.

"It is essential that these engines be oil engines, not merely kerosene burners, or gasoline engines with kerosene attachments. The present-day tractor engine must use as its natural fuel kerosene, distillate or heavier oils at all times, at all loads and under all conditions. Gasoline must be only used in small quantities for starting from cold."

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Stutz Eight-Valve Engine

ON October 4 it was stated in AUTOMOTIVE INDUSTRIES that the Stutz cars would in future be made only with the sixteen-valve engine, the eight-valve being dropped. This was an error, as last year the sixteen-valve engine was used only in the Bearcat model. The roadster four-passenger and six-passenger will have the eight-valve as heretofore.

Tires from the Viewpoint of Riding Qualities

Advantages of Cord Tires Due to Their Principle of Construction—Have Greater Air Capacity Than the Same Nominal Size Fabric Tires, and Not So Much Weight Is Carried by the Less Perfectly Elastic Tire Material

TO secure the best possible riding qualities consistent with moderate upkeep cost and economy of power, cord tires should be used, of adequate size in view of the load to be carried and inflated to pressures lower than have been recommended heretofore by tire makers for tires of the size in question. This was the gist of a talk on Size, Inflation Pressure and Construction of Tires as Affecting Easy Riding, given before the Pennsylvania Section of the S. A. E. on Thursday evening, Nov. 22. It was also brought out that the large tire manufacturers are seriously engaged in developing pneumatic tires for motor trucks of all load capacities, and photographs of 12 in. tires on truck wheels were shown.

J. E. Hale, experimental engineer of the Goodyear Tire & Rubber Co., who was slated to read the paper of the evening, was unavoidably absent, but his assistant in the Goodyear experimental department, William S. Wolfe, took his place and gave a largely impromptu talk on the subject of tires.

Cushion Tires

In order to obtain greater cushioning power dependent solely upon the elastic deformability of rubber, cushion tires have come into extensive use. These are made of softer and livelier compounds than solid rubber tires, and the material is used in larger quantities. Manufacturers of cushion tires always recommend that a somewhat larger size be used than the size of solid tire corresponding to the load to be carried. The Goodyear company makes two forms of cushion tires, in one of which there is an air chamber in the center and in the other of which there is an overhang of the tread on both sides. The essential feature of every cushion tire is that it allows of greater distortion of the rubber than does a solid tire.

In the passenger car field the pneumatic tire has firmly established itself, but a struggle for supremacy between solid and pneumatic tires is about to open in the heavy trucking field. All of the large tire companies are at present experimenting with tires for heavy trucks. Pneumatic truck tires of 6, 7 and 8-in. width are already in common use, and 10 and 12-in. sizes are being developed and will be placed on the market soon. It is not pretended that these pneumatic tires will last as long, nor that they will keep down the tire cost to the same figure as solid tires, but they will increase the economy of operation in every other respect. These tires will permit of greatly increasing the speed of trucks and undoubtedly double the amount of work which can be done in a day. The fuel consumption per ton-mile will be decreased and so will the upkeep of the trucks. At the present time the larger trucks are provided with governors to limit the governed speed to anywhere from 10 to 15 m.p.h. If pneumatic tires are adopted the governed speed should not be less than 25 m.p.h. and perhaps governors will not be required at all. With the experimental trucks of the Goodyear company speeds as high as 40 m.p.h. were obtained and, in fact, the only limitation on the speed of such a truck is the power of the engine. If the pneumatic tire truck comes, truck makers will undoubtedly adopt engines of considerably greater output in proportion to the rated load, and of a higher speed type than is now in use. The present radius of operation of motor trucks is something like 30 or 40 miles and this would be doubled with pneumatic tires.

As regards the economy in fuel that would result from the use of pneumatics, it is difficult to give any definite figures. The United States Tire Co. gave a figure of 40 per cent for the reduction in fuel consumption, but this claim seems rather extravagant. The Goodyear company has been using pneumatically tired-trucks in its work for three or four years and it is believed that the upkeep of the trucks has been decreased by 50 per cent by the use of pneumatics.

There are three types of pneumatic tires, viz., clincher, quick detachable clincher and straight side tires. The difference between the clincher and the quick detachable clincher is that the former has a slightly extensible bead which permits of forcing it over the clinch of the rim, whereas the quick detachable clincher has an inextensible bead, secured by the insertion of a braid of piano wire in the bead, this braid usually being composed of twenty-two strands. At one time the quick detachable clincher type of tire was in almost universal use, but it is now practically obsolete. All of the leading manufacturers are going in for straight side tires and the Clincher Tire Manufacturers' Assn. has standardized straightside tires for all sizes from 32 by 3-in. up and clincher tires for all sizes below this. Mr. Wolfe said that the S. A. E. has been waiting for some action in this matter on the part of the Tire Association and he believed that the tire and rim division of the Standard Committee at one of its next meetings would adopt the straightside tire as standard for the larger sizes and the clincher as standard for the smaller sizes.

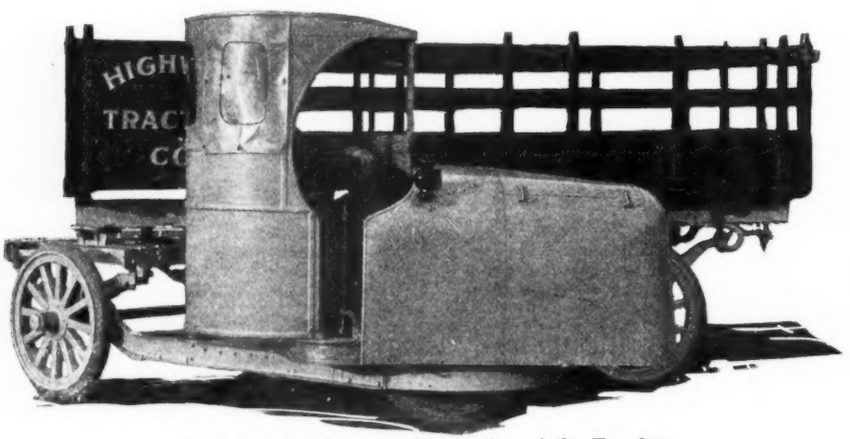
Fabric Tire in Greatest Use

Each of the three types of pneumatic tires enumerated may be either an integral or one cure construction or a two cure construction. The tire in most common use to-day is the fabric tire which has carcass built up of 17¼-ounce duck, close woven, but this fabric construction is now being replaced by the cord construction which has several advantages. There is considerable variation in the cord constructions of the different manufacturers. In the Silvertown cord tire of the Goodrich company there are only two layers of heavy cord, while all of the other companies use a greater number of layers of finer cord. Both the fabric and the cord are laid on a bias of 45 deg. The reason the fabric gives trouble is that each thread of the warp bends around the threads of the woof, and as the tire passes over the road and its tread is bent back and forth, this puts a strain on the threads of the fabric which eventually break. In the cord tire all of the cords of one layer run parallel to each other, hence there is no bending of these threads one over the other. The threads of the adjacent layers, of course, run at right angles to each other, but these layers are separated by a skin coat of pure rubber. As a result of this construction the cord tire offers much less resistance to bending than does the fabric tire, and in going over the road it will yield and snap back much easier. Another result of this is that there is less heat generated in the cord tire than in the fabric tire. This difference between the two constructions can easily be verified by means of a coasting test. A car fitted with one type of tires is allowed to coast down a hill under its own weight, starting from a standstill at a certain point on the hill. After the other type of tires have been fitted the test is repeated, and it is invariably found that the car coasts considerably further on cord tires.

(*Continued on page 973*)

The Trucktor—A New Type of Tractor

Has Single Combined Steering and Driving Wheel and Two Trailer Wheels Which Form Front Wheels of Trailer—Designed for Road Transportation Only



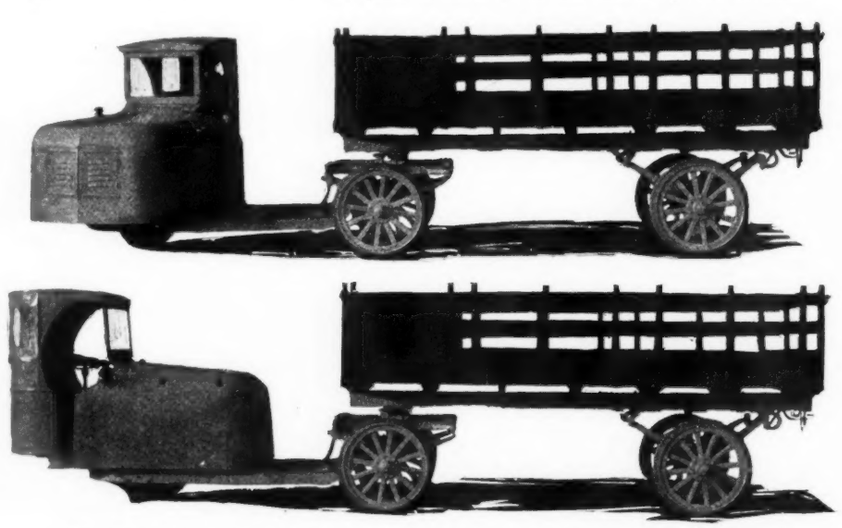
Showing the short turning radius of the Trucktor

COMPARATIVELY little has been done in the United States toward the development of motor tractors for road haulage. The four-wheeled motor truck seems to have been accepted as the standard type of vehicle for commercial transportation, though the advantage of using trailers has been fully recognized, and many trailers may now be seen in operation in certain cities, especially Detroit. An entirely new type of motor-propelled commercial transport vehicle has just been brought to a manufacturing stage by the Highway Tractor Co. of Indianapolis, Ind. It is a three-wheeled tractor, the single front wheel of which serves both as driving and steering wheel and the rear end of which, supported by two wheels, connects to the front end of the trailer by a simple fifth wheel mechanism. All of the wheels are rubber tired, and the tractor is designed for an operating speed of 10 m.p.h.

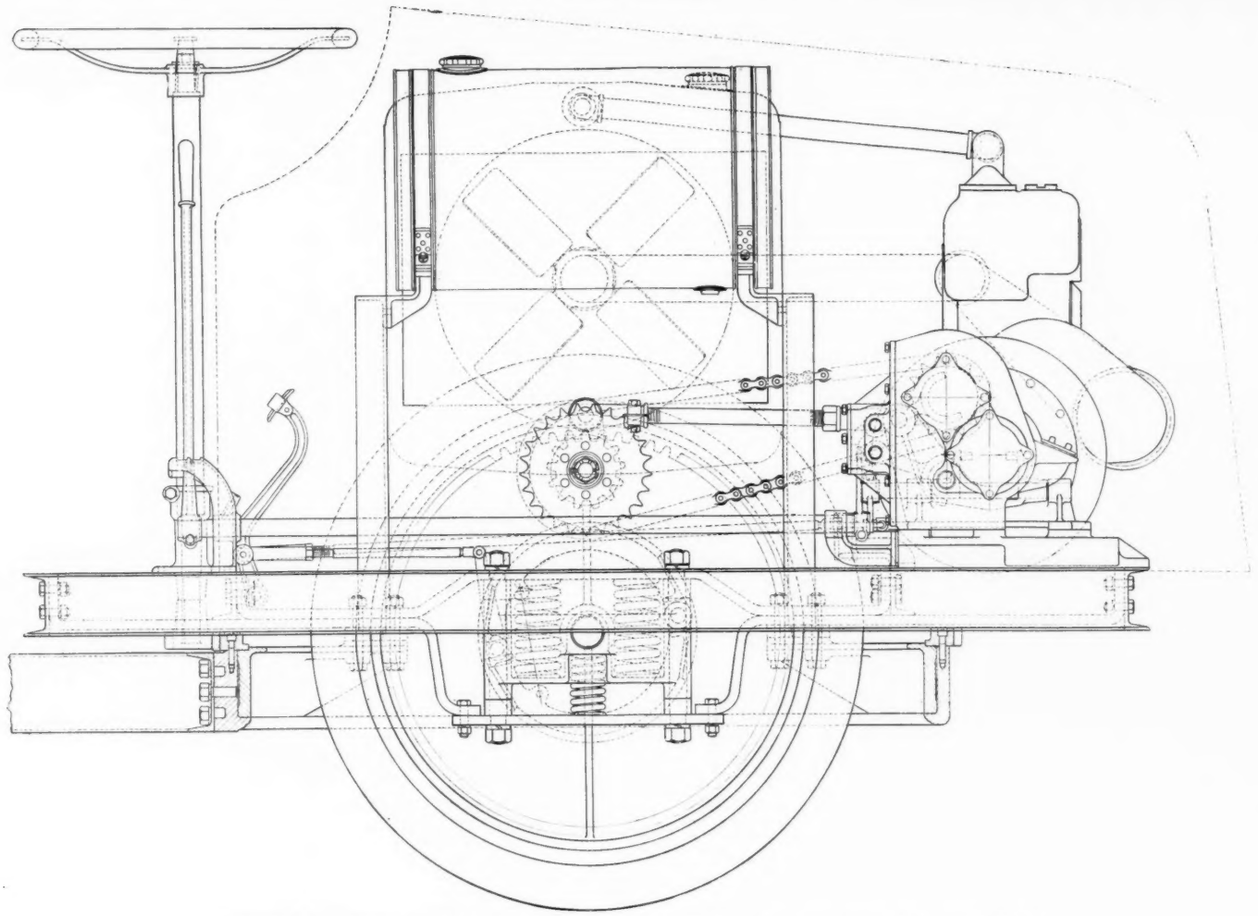
The Highway Tractor Co., which was organized to manufacture this tractor, comprises a number of men well known in the automotive industries. Charles G. McCutchen, formerly of the Jackson Gear Co., Jackson, Mich., is president; Carl G. Fisher of the Fisher Automobile Co., the Prest-O-Lite Co., and various other Indianapolis enterprises, vice-president; James A. Allison, vice-president of the Prest-O-Lite Co., is treasurer, and Henry F. Campbell, formerly secretary-treasurer of the Stutz Motor Co. of Indianapolis, is secretary. The company has a new manufacturing plant at Indianapolis Speedway, and at present is putting through a lot of one hundred of these machines. The tractor is designed to haul loads up to 5 tons, and among the advantages claimed for it are that it can be sold at several hundred dollars less than a motor truck of the same capacity; that it can be completely turned around in a 24-ft. circle; that the power plant need never be idle for any length of time, as it can be quickly disconnected from one trailer and connected to another, and that all of the load is pulled rather than pushed, which reduces the traction resistance under certain conditions. About two years of experimental work was spent upon the machine before the first lot was put in production.

The Trucktor, by means of a ball and socket type of fifth wheel mounted over the rear wheels, can be attached to any type of semi-trailer. An arrangement of springs in the connection takes up shocks in starting and stopping. The construction of the fifth wheel is such that the trailer can be connected and disconnected in a moment's time. There is no limit to the range through which the front wheel with the power plant and driver's cab can be turned. If necessary, it may be turned half way around and push the trailer instead of pulling it.

All of the parts of the power plant are mounted on a heavy cast-iron ring, which is turned off on its circumference and placed in a circular groove formed in the frame of the tractor. The circumference of the ring is recessed over part of its width so as to form a grease reservoir to insure positive lubrication. The steering ring is carried upon the front axle through the intermediary of a set of coiled springs on each side of the wheel. Each set comprises three springs, two supporting springs above the axle box and one recoil spring below same. The springs are set in recesses formed in the axle box, and a strap iron yoke on the frame rests directly upon them, being held from lateral displacement by means of bolts adapted to slide in lugs formed on the axle boxes. As the driving wheel revolves on the axle, the latter is stationary and is secured in the boxes by set screws.



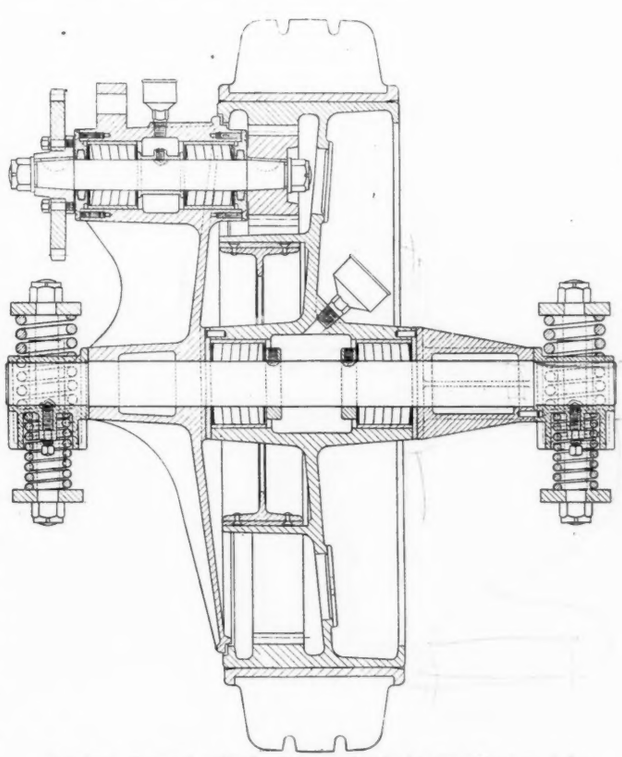
The Trucktor power plant, driving wheel and cab can be swung through any angle desired



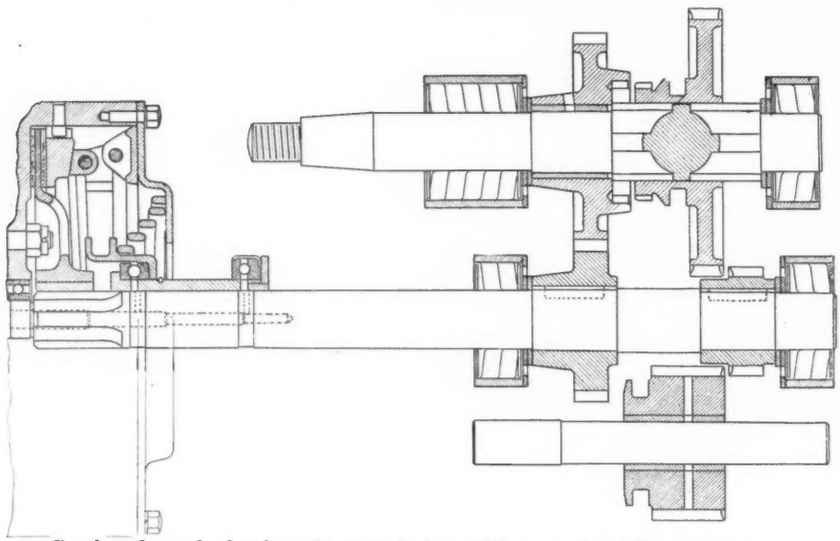
General layout of Trucktor power plant, transmission and steering mechanism

A four-cylinder 3¾ by 5-in. Continental tractor engine is fitted. It is provided with pump circulation through a cellular type radiator, high tension ignition by means of an Eisemann type GU4 magneto, and a governor. The engine sets transversely of the frame when the steering gear is in a straight ahead position, and the radiator is at one side and has a four-bladed fan mounted directly behind it, the latter being driven by a horizontal belt. The fuel tank is carried on a stand behind the engine and has a capacity of 16 gal. A Borg & Beck plate clutch is used to connect the engine with the two speed and reverse sliding gear. The latter is of special design. There is no direct drive in the transmission, the power being transmitted from the primary to the secondary shaft for all speeds. On the primary shaft there are two pinions which are keyed to it and secured against endwise motion. On the secondary shaft there are two gears, of which one, the high-speed gear, is free to rotate on the shaft, but constrained endwise, whereas the other, the low-speed and reverse gear, is free to slide on a four-splined portion of the shaft and therefore always turns with it. The low-speed gear may be secured to the high-speed gear by means of a positive clutch, of which each gear carries one set of jaws. When so engaged the high gear is in. For low speed the low-speed gear is slid into mesh with the low-speed pinion, and for the reverse the low-speed gear is slid into neutral position and the reversing gear, which is of double the width of the other gears, is slid into such a position as to be in mesh with both the low-speed gear and pinion. The gears are cut with 6-8 pitch teeth of ⅞ in. width of face. All bearings in the transmission are Hyatt bearings. There is a large oil filler on the gearbox on the forward side.

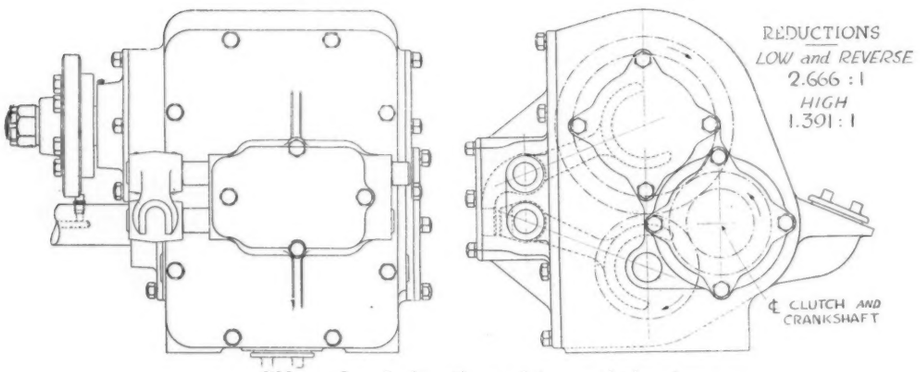
The inner end of the secondary shaft projects from the gearbox and carries a sprocket pinion from which the power is transmitted by a roller chain to a sprocket wheel on a short shaft, which also carries a spur pinion meshing with



Section through single-drive wheel, internal-gear drive and spring suspension



Section through clutch and transmission, with reversing idler swung into plane of main shafts



Side and end elevations of transmission box

the internal gear on the driving wheel. This shaft also is carried on roller bearings. The chain is of 1-in. pitch and ¾ in. width of rolls, while the internal gear and pinion on the driving wheel have a face width of 2½ in. The pinion carrier is in the form of a disc, making a stepped joint with the rim of the driving wheel so as to keep mud and dust away from the gears. Bock bearings are fitted in the hub of the driving wheel. The total reduction from the engine to the driving wheel is 13.38:1 for the high gear and 25.64:1 for the low gear and reverse. The driving and steering wheel is 34 in. in diameter and has a single solid 8-in. tire of the pressed-on type.

Steering is effected by means of a 22-in. hand wheel on a vertical steering post which at its lower end carries a spur pinion meshing with a gear ring secured to the guide of the steering ring. When the steering wheel is turned, the whole power plant, together with the operator's cab and the steering and driving wheel, turns around its vertical axis. As the steering gear has a reduction ratio of 15.8:1, the tractor is comparatively easy to steer. As already pointed out, the power plant, cab and driving wheels can be turned completely around, which makes the tractor particularly suited for operation in congested streets. Heretofore one of the objections to road tractors for hauling trains of trailers has been that they could not be operated in congested thoroughfares, but this objection does not apply to the Trucktor, which turns in a smaller circle than any other four-wheeled truck.

There is a powerful internal brake inside the driving wheel. This is of the expanding sector type and is operated by means of a foot lever convenient to the operator. The gearshift is operated selectively by a hand lever adjacent to the steering post. The frame of the tractor is made of 5-in. channel iron and the wheel base is 93 in.

The whole power plant is covered with a sheet metal hood with large doors in it, permitting of getting at any part requiring attention. For the driver there is a seat which is 35 in. wide by 16 in. steep, this seat being inside a cab with a windshield in front. The rear wheels of the tractor are 36 in. in diameter and fitted with 4 in. solid tires. The weight of the tractor complete is 3100 lb.

Standard Text Book of Automobile Engineering

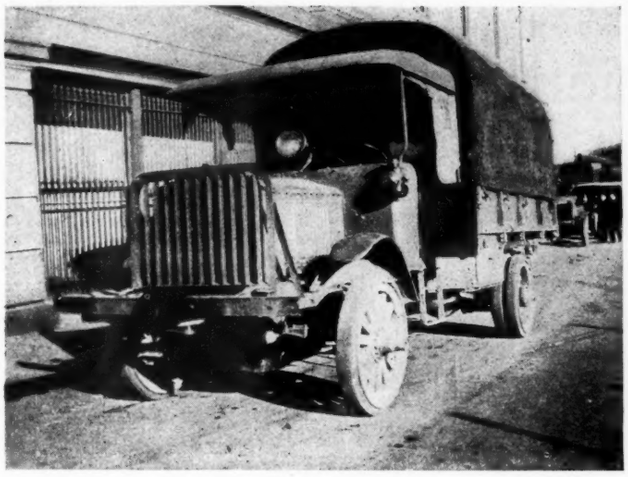
The Gasoline Automobile, Its Design and Construction—Vol. II: Transmission, Running Gear and Control. By P. M. Heldt. Second Edition, Revised and Enlarged. Published by the author at Nyack, N. Y. Pages, 380 text. Illustrations, 32 plates. Price, $5.

OF the innumerable books which have been published dealing with gasoline automobile design unquestionably the two volumes written by P. M. Heldt rank as the standard works on the subject. Owing to its having been published much earlier, there is no doubt that the first volume, which deals entirely with automobile engine design, is far better known than the second volume, which covers the whole of the rest of the chassis. Volume II, however, is entirely fit to rank with Volume I, and a new edition just published brings the subject right up to date from the year 1913, when the first edition of Volume II appeared.

Several new subjects are dealt with, for example, dry plate clutches, helical bevel gear drive, critical speed of propeller shafts and four-wheel drives for trucks. Combination bevel and spur gear rear axle drives are another new subject. Springs have been extended to include the cantilever form, and such modern devices as disc universal joints are treated. Much new material has also been included in the appendix, mainly of tabular matter relating to engineering practice.

The book covers automobile engineering strictly from the designer's standpoint, dealing with the functions of the different parts, their principles of operation, advantages and disadvantages of alternative forms of construction, materials employed for the different parts, heat treatment of these materials, allowable stresses in the material, calculation of the necessary dimensions, machining of the parts and tests thereof. In the revision of the book the very considerable increase in engine speed in recent years has been constantly kept in mind. Also the "experience constants" given in every chapter, such as the normal friction force per unit of area in all types of friction clutches, were compared with the latest practice and revised where found necessary.

Incorporated in the book is a plate supplement consisting of sectional line cuts of the principal parts of chassis, such as transmissions, clutches, axles, steering gears and control layouts, and halftone cuts of a variety of complete chassis.



The general view of the 3-ton Signal Corps truck, showing its general make-up. Notice the bumper, radiator guard, extremely wide cab and large tool box on the body at the left

A light 1½-ton Signal Corps truck equipped with 35 by 5 pneumatics in the front and 38 by 7 in the rear. It has its own air pump to inflate the tires quickly in the field

Two Sizes of Standardized Signal Corps Trucks

UNLESS it be misunderstood that the Class A and Class B war trucks are the only trucks to be used by the United States Army, attention is here drawn to the two types of standardized motor vehicles which the Signal Corps is now testing in and around Washington, D. C.

Due to the different work which the Signal Corps trucks will be called upon to do, they vary in quite a few details from the Quartermaster Corps Class A and Class B vehicles. The Signal Corps trucks are standardized, however, and were worked out under the direction of Capt. Arthur J. Slade in one month as compared with three months for the Class B Quartermaster Corps truck.

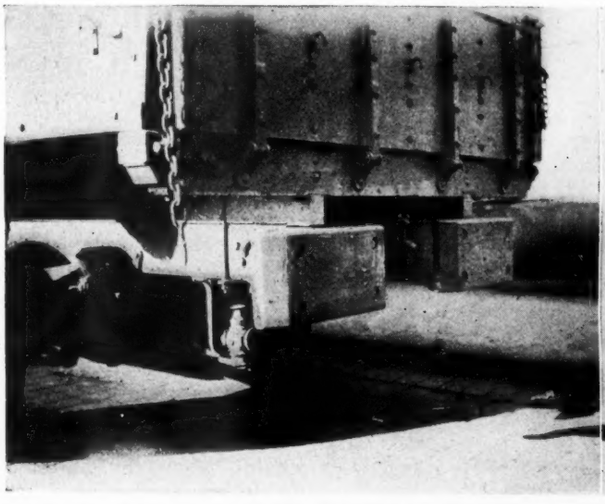
The Signal Corps trucks are divided into two classes, a light truck for loads of 1½ tons and a 3-ton model. It is understood that approximately two trucks of the light type will be ordered to each one of the heavy. Both trucks will be special assembled jobs made from standard parts.

The first order for the lighter vehicles has been placed with the General Motors Truck Co., Pontiac, Mich., while a considerable number of the heavier units are now being turned out by the Federal Motor Truck Co., Detroit; the Kelly-Springfield Motor Truck Co., Springfield, Ohio, and the Velie Motors Co., Moline, Ill.

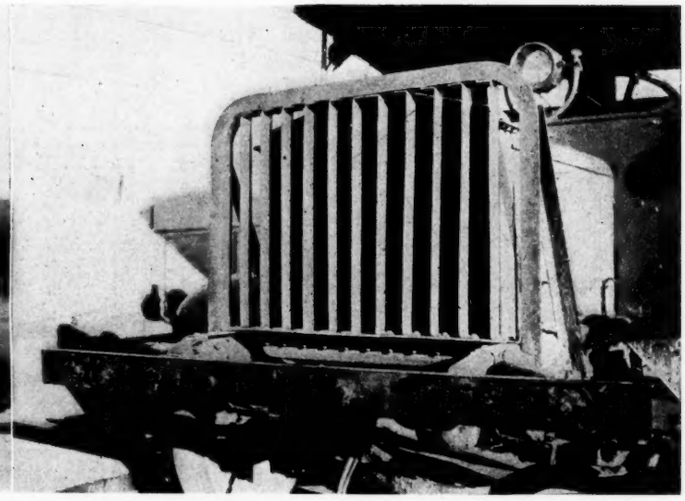
Perhaps the most unusual feature of the light Signal Corps truck is the tire equipment, which will be a Goodyear straight-sided, cord-construction casing with all-weather treads on both front and rear wheels. The front tires are 35 x 5 and the rears 38 x 7 pneumatics.

In brief, the light truck has a unit power plant with a four-speed gearset and a final worm-drive employing radius rods to take the driving propulsion. The standard parts included in the truck make-up are a special Continental truck engine lubricated on the combination forced-feed and constant-level splash system, a Marvel carbureter, an Eisemann high-tension magneto, a tubular radiator with the water circulated by means of a centrifugal pump, a Monarch suction governor, a multiple-disk clutch, a Brown-Lipe four-speed gearset, a solid propeller shaft in two parts, with three universals and supported in the center on a self-aligning ball bearing, and a Timken-David Brown worm-driven axle.

The large Signal Corps truck is similarly made from standard parts.



The rear bumper on the 3-ton truck, showing how it is cut in the center to admit of the trailer drawbar. Note also the unusual mounting of the rear tail light by means of a special bracket and its out-of-the-way position to prevent damage through collision



A close-up of the 3-ton Signal Corps truck, showing the standard type of angle-iron radiator guard and the manner in which it is braced by side angle-irons. Note also the bumper in front and the searchlight at the center of the dash

Creeper Tractor Ancient Invention—III*

Effect of British War Office Encouragement—Roberts Developments Finally Consolidated with Holt Tractor Design—No Work of Importance Done by Continental Inventors—Creeper Drive Essentially an Anglo-American Contribution to Engineering

IN concluding the last of this series of articles mention was made of the fact that in the early years of the twentieth century progress in creeper type tractor design was greatly hastened by the interest of the British war office. The machine which emerged from the war office trials with the greatest reputation was the Roberts chain track tractor, for which patents were granted in 1904. This was the invention of David Roberts of the firm of Richard Hornsby & Sons of Grantham, England, a very well known manufacturer of gas engines and of the well known Hornsby-Akroyd oil engines. Probably the most striking feature of this machine was that it is the first instance on record where the differential method of steering is shown.

Roberts arranged to carry the weight on six wheels, three on each side, these resting on the chains. There were two sprockets lifting the chains well above the ground level at the front end, which were idlers. At the rear were two other sprockets driven through a double differential. For steering brakes were applied to either side of the differential, thereby causing one side to go ahead faster than the other.

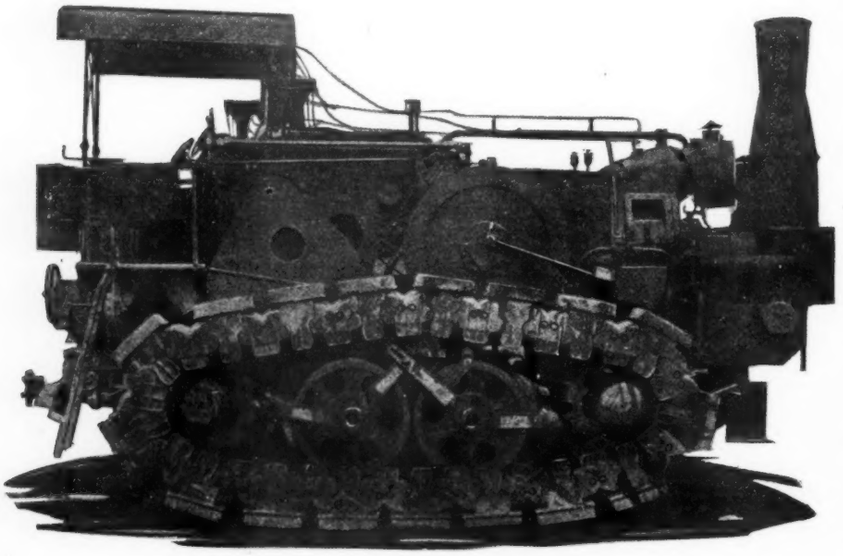
The detail of the chain was such that it provided almost a solid rail on which the vehicle could run. It will be noticed that each link was fitted with a very massive tread piece and that the tread pieces interlocked with each other on the straight part of the chain. This meant that the weight theoretically placed no stress on the hinge pins of the chain, which had merely to resist the tension due to the driving effort.

In the illustration of the side view of the machine it should be noticed that a small wheel carried on an adjustable arm took the weight of the upper part of the chain.

The first Roberts chain was applied to a tractor burning kerosene and was demonstrated to the British War Office at various dates from July, 1905, onward. Of these demonstrations the most important, the one which, in fact, decided the British army to take up this type of tractor, took place in February, 1906. Immediately after this demonstration Roberts took out further patents for improvements in the chain track. His later idea is shown in one of the accompanying illustrations. This makes the detail of the chain fairly clear; it may be added that the links were preferably to be made of malleable iron or cast steel. They were hinged together near the upper edge; each of the inside links was cast in one piece, while each of the outside links was divided lengthwise into two parts, which were secured together by bolts. The tread consisted of blocks of wood or other suitable material kept in a kind of clincher channel.

An order was given to Roberts by the British War Office for a 70 hp. Hornsby tractor fitted with his improved chain, and work on this was commenced in August, 1906. In that month the Hornsby company purchased a 40 hp. Rochet-Schneider automobile and fitted to it a chain track of the same sort, but of much lighter construction. This car appeared in War Office trials at Aldershot in May, 1908, and it was during these trials, where the heavy Roberts tractor also appeared, that the idea of the tank was first suggested. The War Office ordered several more tractors from Roberts from 1906 right up to 1914, just before the outbreak of war.

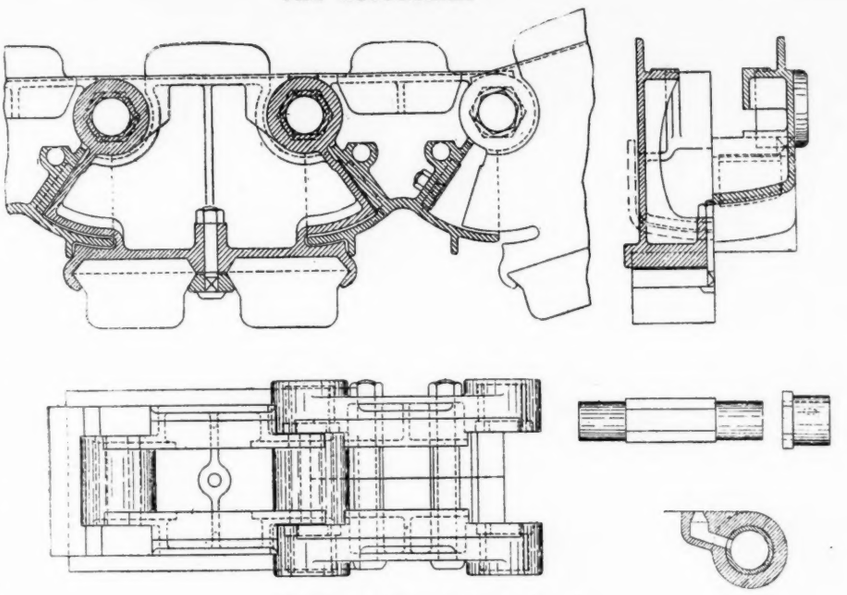
Invention at this time was proceeding so rapidly that it becomes a little difficult to keep the different ideas in proper sequence. However, about 1906 the Phoenix Mfg. Co. of Eau Claire, Wis., began to build "locomotive sleds," as they called them, for log hauling. This tractor was very much on the lines of an ordinary locomotive having a chain track drive instead of the coupled driving wheels, and two long skids in front by means of which steering was performed. This machine had quite an ingenious chain track, the weight-bearing chain being separate from the driving chain. The latter was a roller construction of normal type and the actual track chain completely encircled the driving chain, as shown in the cut. It should be noticed that the track chain was carried quite clear of the drive chain when the latter passed around the sprocket.



Roberts military tractor, 1907

*The data from which this article was written, and the illustrations, are taken from *The Engineer*, London, which published a series in issues from Aug. 10 to Sept. 14, inclusive, this year.

A very similar machine also patented in the United States was the invention of Alvon L. Lombard. Lombard made use of the same idea as the Phoenix people in separating his driving chain from the tread chain, but not in quite the same way. From the drawing of the Lombard machine it will be observed that the tread chain ran around two sprockets and that the same shaft which carried the rearmost of these two had an extension to which the driving chain sprocket was secured. Lombard had taken out a patent in 1907 of a somewhat similar nature.

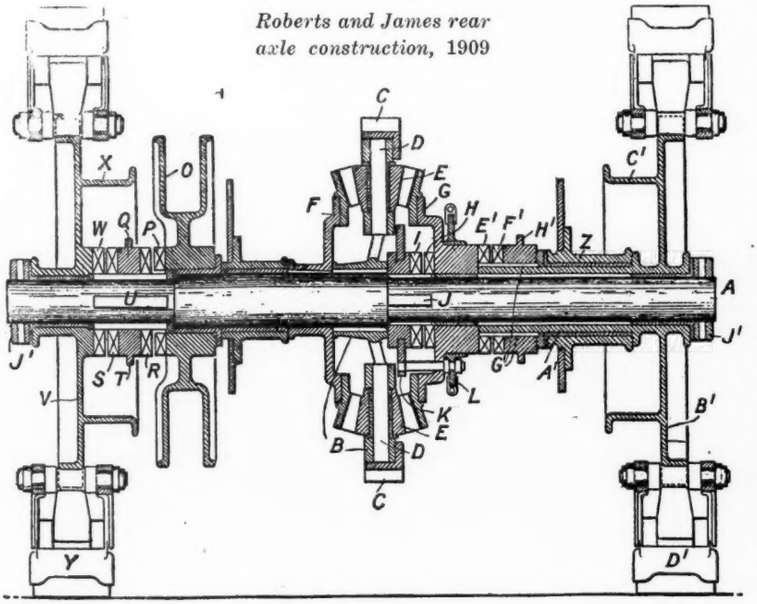


Details of Roberts chain track

According to the investigation made by our London contemporary from whose articles the present series have been extracted, it was just about 1908 that the Holt Mfg. Co., Stockton, Cal., commenced the commercial construction of chain track tractors. Its right to the exclusive use of the term caterpillar is unquestioned in the United States. It is, however, claimed by *The Engineer* that the term caterpillar was first applied by the British soldiers observing the Roberts machine in 1906.

Roberts continued to take out patents quite regularly, each marking some little improvement over the previous model, but the latest type, that is the latest previous to the war, bore a very strong resemblance to the earlier machines illustrated. In November, 1912, his company sold most of their foreign patents to the Holt Mfg. Co. and some of their ideas will therefore be found incorporated in the modern Holt machine. One of their most thorough patents was for a rear axle construction which would give forward and reverse drive coupled with very rapid starting. Referring to the cut, *A* is the main driving axle and *B* the center gear wheel of the compensating gear which carries the main driving wheel *C*, which is driven by the engine. *D D* are pins attached to the compensating gear wheel *B*, and *E E* are bevel pinions mounted loosely on them. *F* is the left-hand bevel wheel which is keyed to the driving axle *A*, and *G* the right-hand bevel wheel which is mounted on it.

Roberts and James rear axle construction, 1909



These two wheels *F* and *G* gear, of course, with the pinions *EE*. *H* is a claw clutch formed on the inner face of the bevel wheel *G*, and *I* is a claw clutch which slides on keys *J* formed on the shaft *A*, and engages with the clutch *H* to lock the compensating gear, *K* and *L* being collars by means of which this clutch is moved axially. *O* is the winding drum, and *P* a claw clutch formed on its outer face. *Q* is a claw clutch with two faces *R* and *S*, and *T* is the collar by which this clutch is caused to slide axially either to the right or left on keys *U* formed on the axle *A*. *V* is the left-hand sprocket wheel which is loosely mounted on the axle *A*, and *W* is a claw clutch formed on the inner face of its boss, *X* being the steering brake drum which is also attached to it. *Y* is the left-hand chain track which is propelled by the sprocket wheel *V*. *Z* is the right-hand axle bearing in which revolves the sleeve *A'*, to which sleeve is attached the right-hand sprocket wheel *B'*, which carries the right-hand steering brake drum *C'*. *D'* is the right-hand chain track which is propelled by the sprocket wheel *B'*, and *E'* is a claw clutch which is formed on the outer face of the boss of the right-hand bevel wheel *G*, and which can be brought into engagement with the claw clutch *F'*, which slides on keys formed on the sleeve *G'*. *H'* is a collar by which the clutch *F'* is actuated, and *J' J'* are collars holding all the wheels in position on the axle.

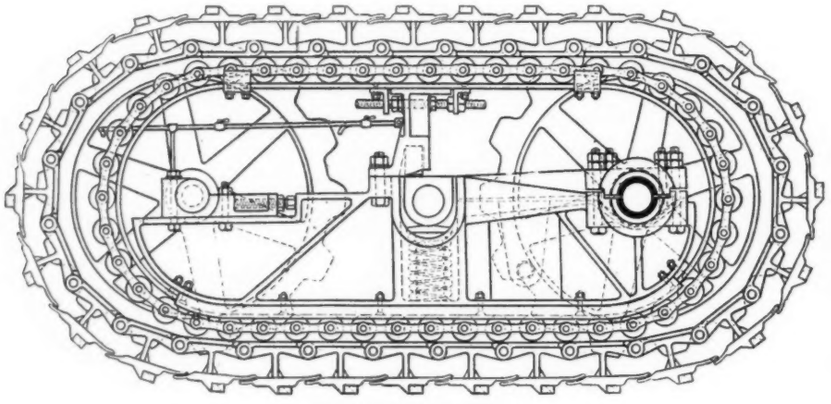
As shown in the drawing, all the clutches are out of gear. Suppose that it be desired to propel and steer the vehicle in the ordinary way. To do this the clutch *Q* is slid axially to the left, so that its face *S* interlocks with the face *W*, formed on the sprocket wheel *V*; and the clutch *F'* is moved to the left, so that it interlocks with the clutch *E'* on the bevel wheel *G* of the compensating gear. The drive will then be transmitted to both chain tracks equally, and the machine will travel in a straight line. Steering is effected by applying brakes either to the drum *X* or to the drum *C'* as may be required.

When it is desired to apply the full power of the engine to the left-hand chain track, so that the vehicle may be turned to the right, the claw clutch *F'* is disengaged from the

clutch E^1, and the compensating gear is locked by the clutches I and H, the claw clutch Q being slid axially to the left to engage with the claw clutch W. The brake is also applied to the brake wheel C^1. Similarly, to apply the full driving power to the right-hand chain track, the claw clutch Q is slid out of gear with the clutch W and into its central position, and the clutch F^1 is put into gear with the clutch E^1 on the bevel wheel G of the compensating gear so as to lock the latter through the sleeve A^1 to the sprocket wheel B^1. The brake is also applied to the left-hand brake wheel X.

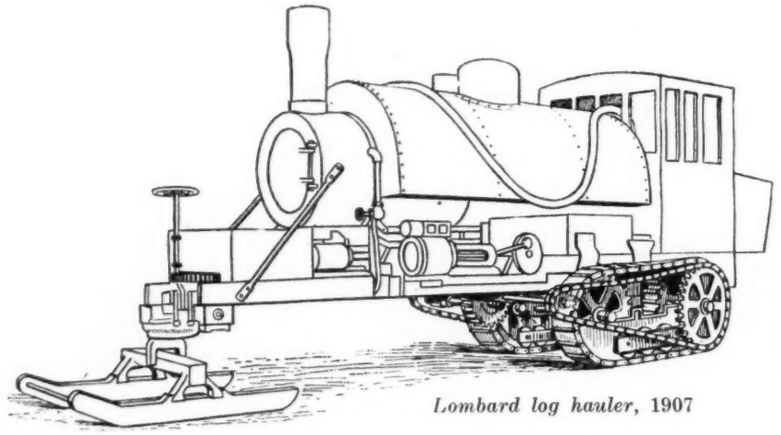
We now return to P. J. Diplock, who took out a patent in 1910 for a chain track machine. As can be seen from the drawing, this combines the chain track idea with the Diplock feet as used on the pedrail wheel. It is, in fact, a pedrail wheel spread out around the length encompassed by two sprockets. Diplock intended this machine to be used either for driving on a tractor or for mere load carrying on a trailer. A trailer was built in 1911, but is believed to be the only machine ever constructed with this type of tread. Diplock was still working on his original idea: that the members which stand upon the ground, that is the feet on the original pedrail, and now the feet arranged around his chain, should have as little as possible of definite and rigid interconnection.

In 1912 and 1913 he took out a further patent which had the central idea that in order to reduce friction, therefore to permit propulsion with a minimum expenditure of power, these feet must be perfectly flexible. In the 1912 invention each foot is carried by the lower end of a rod the upper end of which is suspended from the tip of a carrier. The side sway from the foot which is required when the vehicle is turning is obtained by movement of a rod within the carrier; other motion is provided for in its connection to the lower end of the rod. In this mechanism springs play a leading part and it is a matter of record that introducing springs did permit considerable increase in the mechanical efficiency of the drive.



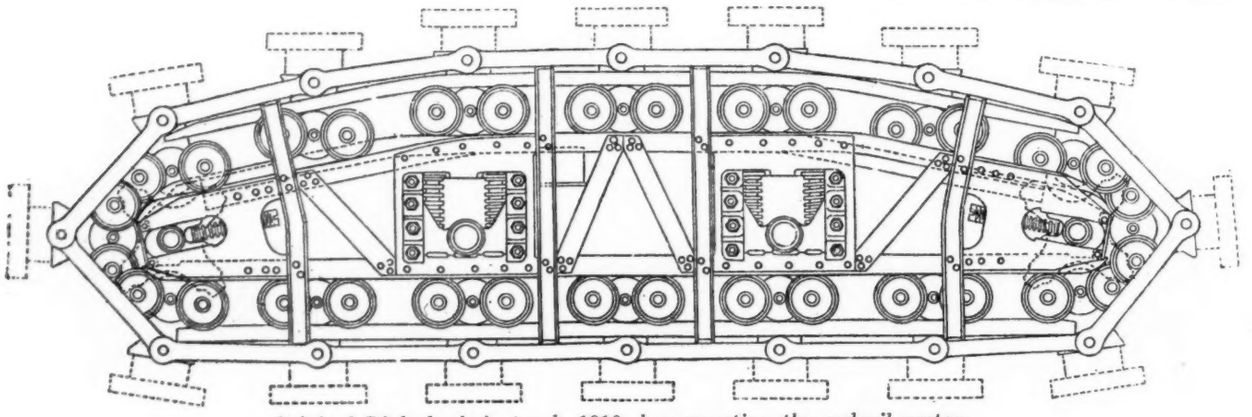
Centiped chain track

In the present type of pedrail tractor now being made by Diplock, springs are introduced between the feet and the movable part of the track, also the sprockets are kept well near the ground, the weight-bearing frame being turned up at the end. This causes the feet to come down on the ground along an inclined plane, so giving a very comfortable and easy action. A special form of roller chain is used having side rollers as well as the ordinary transverse kind, so that the engagement of the links with the tooth of the sprocket is almost entirely a matter of rolling friction, no side sliding friction being allowed.



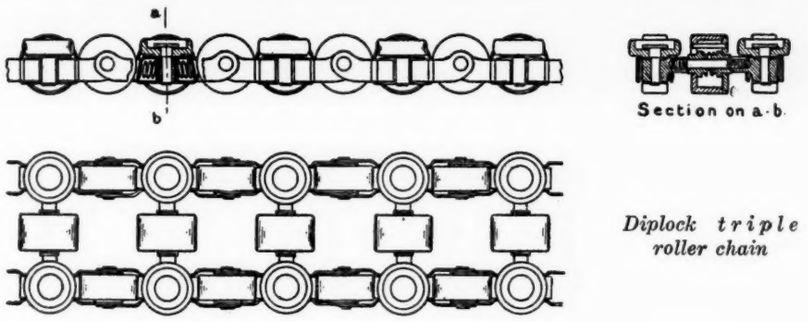
Lombard log hauler, 1907

This review brings the development of the chain track tractor practically up to date. Of course, there have been many inventions other than those mentioned in this brief digest of *The Engineer's* much longer series of articles on the subject. In concluding the latter the author remarks that it will no doubt be noticed he has made no reference to any inventions other than



Original Diplock chain track, 1910, *incorporating the pedrail system*

those of a British or an American origin. He states that this was not for lack of search among the patents of other countries, but that it does appear on close investigation that all developments in Continental Europe have been sequential to either American or English invention. While France, Germany and even Austria have adopted and employed the idea in many different forms, their patent records do not disclose any origination in this connection.

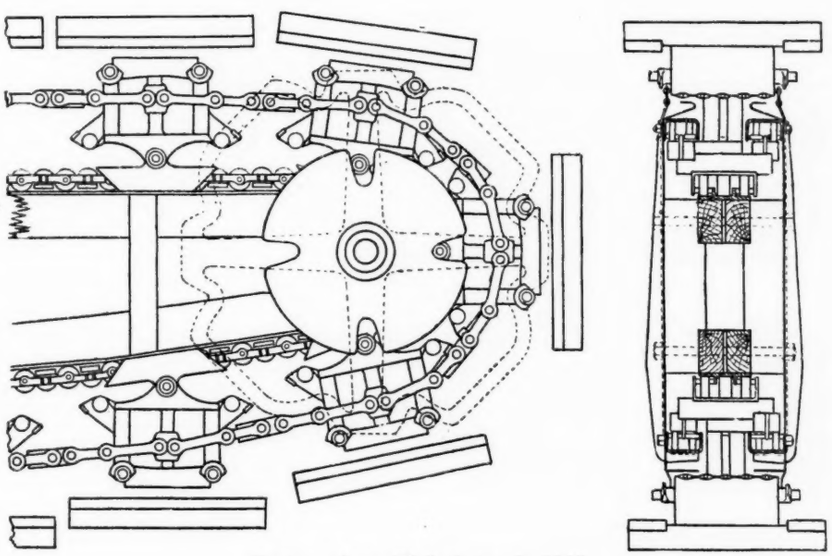


Diplock triple roller chain

The Future

The articles in *The Engineer* do not carry the subject beyond August, 1914, yet it is hard to believe that war service has not shown many things which we shall be able to apply in the future. For instance, there is the interesting comparison of the conventional chain track with the Diplock system of individually flexible feet attached to the chain. Diplock's reasoning seems logical; that is there is no reason to doubt that efficiency might be increased by the use of his devices, provided their mechanical detail is not troublesome. Undoubtedly development will take place in the direction of eliminating friction from chain tracks.

While the power lost in the conventional creeper drive is much less than would at first be imagined, it is still considerable, and is greater than that absorbed by a wheel drive when operating on reasonably hard ground under favorable circumstances.



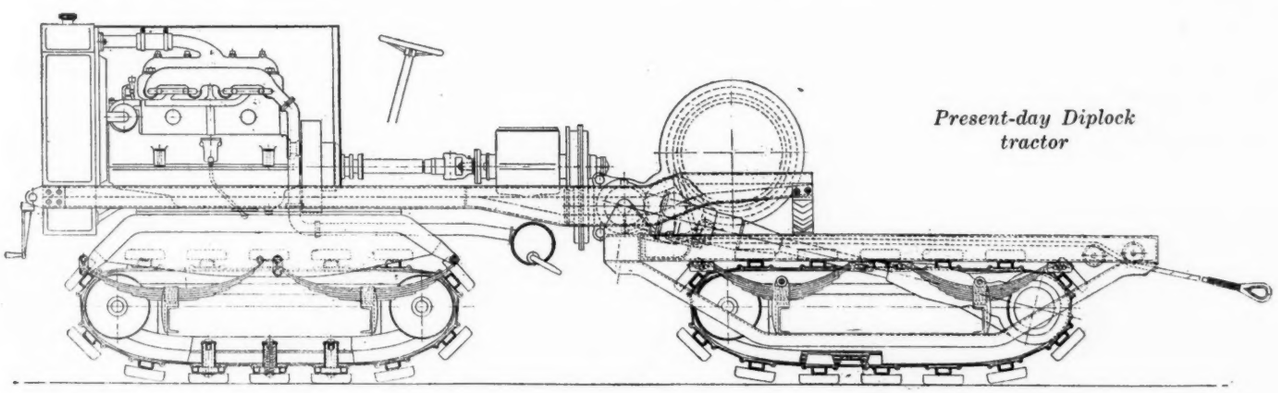
Feet used on Diplock track, 1913

It is from the smaller tractors in use by the armies that we should expect to learn most. The very big tractors, the tanks and the tractors which haul siege guns, are such vast and cumbersome machines that they bear little relation to the tractor of commerce and agriculture. There are, however, probably thousands of small Holt and similar tractors used for the lighter forms of artillery, even for hauling supplies over roadless country and so forth. It is in such service that the closest parallel to peace time usage will be found.

The creeper drive is often claimed to be the ultimate system. Its manufacturers are mainly strong in the belief that a few more years of experiment will make the chain track more efficient than a wheel drive for all agricultural purposes.

It is particularly interesting to see how Diplock changed over from the wheel to the chain, retaining his idea of flexible feet. In other words, it seems that Diplock has found the chain a better base for the feet than the wheel. The chain construction certainly looks to be a similar means for getting the feet on the ground.

A matter of great importance not touched upon in this historical review, except in the case of Diplock, is the design of ground gripping devices. Whether these be fixed to a wheel or to a chain the efficiency can be changed considerably by the choice of suitable or unsuitable lugs, feet or other devices. This is a science which is more in its infancy perhaps than any other feature of tractor engineering. It is a little thing, liable to pass unnoticed, but it is highly important.



Present-day Diplock tractor

Analysis of Crankshaft Stresses—II*

Features of Different Bearing Layout—Effect of Number of Cylinders—Difference Between Six and Twelve of Same Size

By Otto M. Burkhardt
Research Engineer Pierce-Arrow Co.

ALL forces acting on the crankpin necessitate reactions on the main bearings. The total load on the main bearings of course also includes the centrifugal forces due to the crankpin and the adjacent crank cheeks. Theoretically, and now even practically, it is a simple matter to attach weights to the crankshaft that will relieve the main bearings of the centrifugal forces. Whether or not it is an advantage to do so we shall presently investigate by means of diagrams.

The forces that we have to deal with at first are those relating to the six-cylinder engine resolved into components determined by a crankshaft of the seven bearing type.

We are now concerned with two groups of diagrams. First: **The main bearing load for a crankshaft without balance weights.**

Fig. 7. Loads on main bearings I and VII (Counting from front of engine).

Fig. 8. Loads on main bearings II, III, V and VI.

Fig. 9. Loads on main bearings IV

Second: **The main bearing load for a crankshaft with balance weights.**

Fig. 10. Loads on main bearings I and VII.

Fig. 11. Loads on main bearings II, III, V and VI.

Fig. 12. Loads on main bearings IV.

It is, of course, plainly evident from the scale of the diagrams that the balance weights considerably reduce the loads on the bearings, but as already stated, magnitude is not the last word to be said about loads. Sudden fluctuation in the direction of the load is equally, if not more, detrimental to a bearing than mere load. Quick changes in the direction of a force acting on a mass are always accompanied by inertia effects. We must expect, therefore, that the journals carrying loads as shown in Figs. 10 to 12 will perform an undesired reciprocating or rocking action. Figs. 7 to 9, however, represent comparatively steady loads. The journals carrying these loads will creep around on the bearing surface, which in principle is like a planetary gear rolling within an internal gear. This facilitates lubrication because the lubricant while adhering to the metal surfaces is continually wedged in between the two confining surfaces. From this we see that beyond pounds of load per bearing there is so far nothing to say in favor of balance weights.

The length of the bearings necessary to carry the respective loads safely, we shall determine by means of the formula:

$$p\,v = 17{,}000 \text{ ft.-lb. per second.}$$

With a main bearing diameter of 2⅛ in., we obtain for 2700 r.p.m. of the engine a circumferential velocity of

$$v = 25.02\ \frac{\text{ft.}}{\text{sec.}}$$

The mean loads on the bearings as obtained from the diagrams are tabulated below, together with the necessary bearing length, the value of $p \times v$, and the specific bearing pressure.

A. Balanced crankshaft.

Bearing number	Mean load, lb.	Theoretical bearing length, in.	Value of p x v	Mean specific bearing pressure, lb.
I and VII	774	9/16	16200	648
II, III, V and VI	839	⅝	15800	633
IV	1520	1 1/16	16725	670

B. Crankshaft without balance weights.

Bearing number	Mean load, lb.	Theoretical bearing length, in.	Value of p x v	Mean specific bearing pressure, lb.
I and VII	2180	1 9/16	16425	657
II, III, V and VI	2190	1 9/16	16500	660
IV.	4350	3	17040	682

In case of bearings I and VII a liberal amount should be added to the length of the bearing to take care of the loads due to the timing gears and the flywheel, and at least one quarter inch should be added to every bearing to allow for fillets. But in spite of this we find that the bearing lengths given under A are entirely too short to hold the requisite oil pressure. If they are lengthened so that they are in conformity with this practical consideration we will obtain for a crankshaft with balance weights, bearings about as long as those given under B for a crankshaft without balance weights.

Apart from these analytical considerations it has now become an established fact that neither smooth running nor the life or the power of a well designed engine with a seven-bearing shaft can be improved through the addition of balance weights—this in spite of the fact that any shaft with balance weights will perform much better on any balancing machine than its prototype without balance weights. This paradoxical result is quite easily explained if we bear in mind that a shaft when running in a balancing machine is not subject to the sudden impulses which are a necessary evil inherent to the reciprocating engine. It seems that the best method to make these impulses harmless is to smoothen them by means of the centrifugal forces.

It remains now to determine the loads on the main bearings for our twelve-cylinder engine in a manner similar to that which we adhered to in the case of the six. However, since

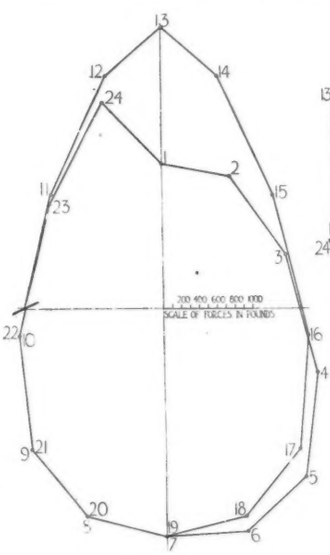


Fig. 7

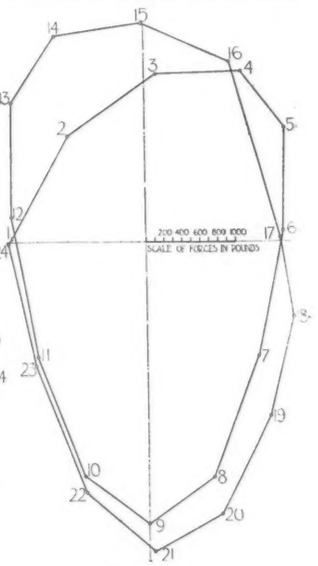


Fig. 8

*Paper read Oct. 24 before the Buffalo Section of the S. A. E.

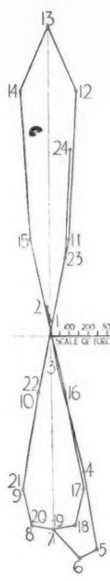


Fig. 10

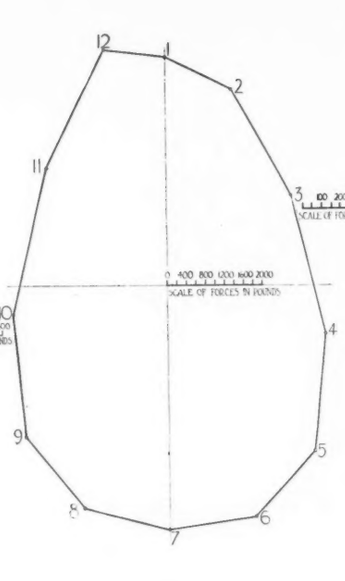


Fig. 9

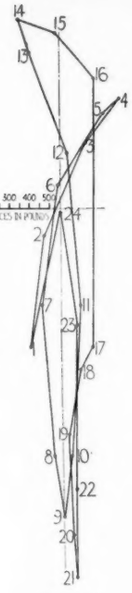


Fig. 11

there is not the slightest difference in the procedure it is permissible to draw conclusions from former results. We must, therefore, reconcile ourselves with the fact that in all cases the mean pressure of a complete cycle will be about 15 per cent in excess of the corresponding pressures represented in Figs. 7 to 12. This conclusion is based on the results derived from the force diagram shown in Figs. 2, 4 and 6. These diagrams revealed that the mean pressure on the crankpin of a twelve-cylinder engine is 15 per cent larger than that on the crankpin of a six.

It may be well to remark that in the case of a twelve with two connecting-rods mounted side by side on one crankpin there is not a uniform distribution of load over the whole length of the crankpin, because the two connecting-rods, independent of one another, do not at every instant act with equal intensity. The point of application of the resulting loads given in Fig. 6 is therefore not in the middle of the crankpin as is the case with the loads given in Fig. 2. The two main bearings adjacent to the crankpin (seven bearing crankshaft) will not receive at every instant exactly half the loads given in Fig. 6, but alternately the one will receive somewhat more and the other somewhat less than half of the total for well-known reasons of mechanics.

This rough and ready analysis, however, permits of the conclusion that the main bearings of a twelve-cylinder engine should be designed to give at least 15 per cent more bearing surface than main bearings which have proved successful for a six-cylinder engine of equal capacity.

In the preceding work we have been dealing with various dimensions for crankpins and main bearings. These dimensions were chosen according to the dictation of sound engineering. While this method is satisfactory it is well to verify the results obtained, perhaps in the following manner: Both engines so far spoken about probably will develop a maximum torque of about 3000 in.-lb. This would correspond to about 48 hp. at 1000 r.p.m. However, the torque on the crankshaft is subject to considerable fluctuation, depending on the number of impulses. This fluctuation, which of course has some bearing on the smoothness of an engine, has been made the subject of many investigations in the early days of the six and again at the advent of the eight and the twelve. These investigations have revealed that the multi-cylinder engine, six, eight, twelve, etc., certainly deserves a good deal of credit for its smooth torque.

Due to the small number of impulses the torque on the crankpin of a six-cylinder engine may at intervals be two and a half times as large as the torque indicated on the dynamometer. In considering the strength of the crankshaft we have, therefore, to deal with a torque of say 7500 in.-lb. With a crank radius of 3⅛ in. we derive from this torque a tangential force of 2400 lb. acting through the crank cheek on the crankpin as indicated in Fig. 13. If we at first assume the crank cheeks as being infinitely strong we can consider the crankpin as a cantilever.

With a crankpin length of 2 in. plus half the width of the cheek, the total length of the cantilever will be about 2½ in. The bending moment is consequently $2400 \times 2\frac{1}{2} = 6000$ in.-lb. The moment of resistance to bending of a cylinder 2⅛ in. diameter with a 1 in. hole is .896 in. cubed. With an elastic limit of 110,000 lb. (chrome nickel steel) we obtain from these data a factor of safety of 16.4.

Crankpins are further subject to some shearing and bending due to the load acting directly on the crankpin itself, which in the above calculation has not been taken into consideration. If we allow for these extra stresses we may obtain a final factor of safety of 12, which is not too much for so important a part. After this we may now assume the crankpin to be infinitely strong. From this point of view we must expect the crank cheeks to deflect in a manner as shown in Fig. 13. The twisting moment to be resisted by the cheeks evidently is $2400 \times 3 = 7200$ in.-lb. The moment of resistance to torsion of a rectangular section is $2/9\ b^3\ h$. The permissible fiber stress in case of twist is about 75 per cent of that permissible for bending. Taking this into consideration and maintaining a factor of safety of 12 gives the following equation:

$$7200 = 2\ \frac{.75 \times 110{,}000}{12} \times \frac{2}{9}\ b^3\ h.$$

From this we obtain for $h = 2\frac{3}{4}$ the thickness of the cheek as .925 or to give an even figure 15/16 in. This small special allowance is desirable because the crank cheeks, like the crankpins, are subject to compound stresses. In this connection it may be remarked that the crank cheeks as a rule are found to be the weakest part. Fig. 13 and the calculations explain why so many shafts break along the lines marked a-b-c.

In case of the twelve-cylinder engine, we know that the maximum torque on the crankpin will be only about 50 per cent more than that indicated on the dynamometer. We shall therefore have to deal with a torque of about 4500 in.-lb. With a crank radius of 2½ in. we derive from this torque a tangential force of 1800 lb. acting through the crank cheeks on the crankpin. With a crankpin length of 2 5/16 in. plus half the width of the cheek, we have a total length 2¾ in. The bending moment on the crankpin is therefore $1800 \times 2.75 = 4950$ in.-lb. The factor of safety derived from this is 20. The twisting moment in the crank cheeks is $1800 \times 3\ 3/16 = 5740$ in.-lb.

The thickness of the cheeks, with a factor of safety 12, we derive as before from the equation:

$$5740 = 2 \times \frac{.75 \times 110{,}000}{12} \times \frac{2}{9}\ b^2\ h.$$

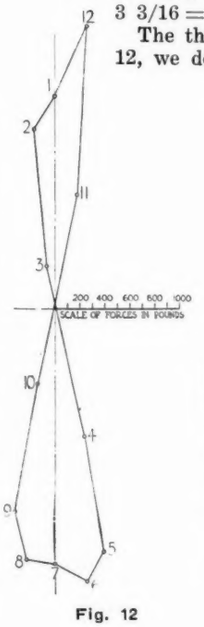


Fig. 12

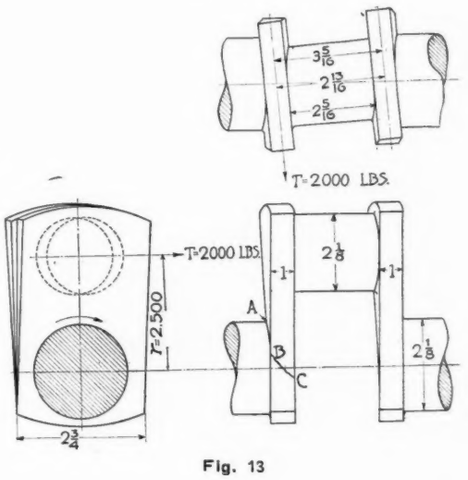


Fig. 13

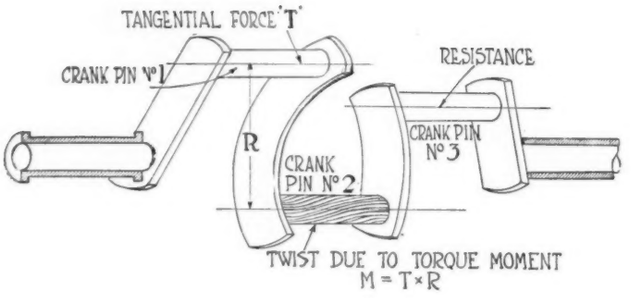


Fig. 14

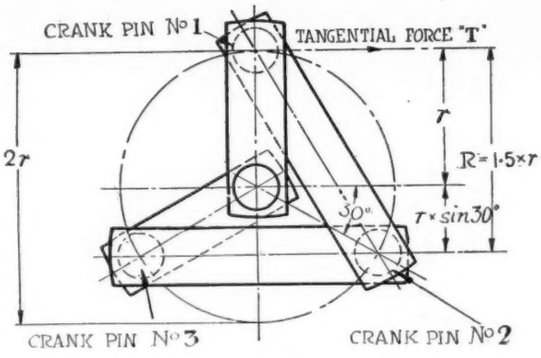


Fig. 15

From this we obtain a cheek thickness of .83 or say ⅞ in. In order now to compare a three and seven bearing shaft it must first of all be observed that the distance between the centers of two main bearings is about two and a half times as much in the former shaft than in the latter. The transverse deflection of a straight shaft increases at the cube of the distance between the supports. It is therefore evident that if other conditions are the same a three bearing shaft will deflect up to $(2\frac{1}{2})^3$; very nearly sixteen times as much as a seven-bearing shaft.

It is hardly necessary to point out that excessive deflections are certainly not conducive to the smoothness of an engine. But not only that, even the durability of the bearings is impaired because a deflected shaft will not permit of uniform pressure distribution in the bearing. Any eccentricity of the loading relatively to the middle of the bearing will create a tendency to drive out the oil at one end. This is the reason why bearings which swivel so as to accommodate themselves to any inclination of the journal due to bending of the shaft are found to be of great advantage. However, as this kind of bearings cannot very well be applied to crankshafts, it is advisable to design crankshafts so that their deflections approach a minimum.

Seven-Bearing Advantage

The deflection of a shaft varies inversely as the moment of inertia of its weakest section. In order then to hold a three-bearing shaft within the same limit of transverse deflection as may be obtained with a seven-bearing shaft, it is evident that the crankpin diameters of both shafts must be proportioned, in the relation of $\sqrt[4]{16}$ to 1, which is as 2 to 1. This necessitates a crankpin diameter of 4¼ in. for a three bearing shaft designed to conform to our premises. For so small an engine as here under consideration, this diameter is of course prohibitive. At the same time it is nearly prohibitive to use in case of motor car engines a seven-bearing shaft for a twelve on account of the excessive length. The only alternative left for the designer of twelve-cylinder motor car engines is then to sacrifice rigidity.

The torsional deflection of a crankshaft is directly proportional to the torque moment. In a seven bearing shaft a torque moment of the magnitude $M = T \times r$ occurs in the main bearings only. This torque is determined by:

T = Tangential force acting on crankpin
and r = Crank radius.

In a three bearing crankshaft a similar but more intense torque occurs not only in the main bearings but also in the crankpins as is illustrated in Fig. 14. The momentum of the torque in this case is determined by T and the shortest distance between T and the center of the twisted crankpin, which is denoted with R. From Fig. 15 we find that: $R = r + r \sin 30$ or $R = 1.5\ r$. Consequently in this case $M = T \times 1.5\ r$. This permits us to draw the conclusion that the torque moments or torsional deflections of three and seven bearing crankshafts, stand to each other in the relation of 1.5 to 1. It must further be mentioned that the twist in a crankpin is a more serious matter than the twist in the main bearings. We must consider that a twist in a crankpin cannot be reduced in its effect to set up vibrations by any other means than an increase in diameter. The deflections in the main bearings may, however, be minimized by vibration dampers.

The same line of reasoning which we establish in connection with the three bearing shaft must be followed by investigating a four bearing six throw shaft. The distance between two bearings is about 1.75 times as large as in the case of a seven bearing shaft and consequently the transverse deflection is about five times larger. With regard to the torque in the crankpins the same figures as before established are in order here with the only remark that in this case a smaller number of crankpins are subject to twist.

Balance Weights

As excessive transverse deflections must be detrimental to the bearings as well as to the smoothness of the engine, it is quite reasonable to expect that balance weights will be an advantage for the latter two types of crankshafts which are inherently weak. It is an established fact that seven bearing shafts when well designed are inherently strong enough so that they cannot be improved through the addition of balance weights. We can therefore predict that the use of balance weights will be limited to shafts with a smaller number of bearings than would be desirable from the viewpoint of strength. Balance weights are like the flywheel, the symbol of some imperfection. If we compare shafts of equal strength we will further find that a three or four bearing six throw crankshaft that is properly balanced will by no means be lighter than a seven bearing shaft.

The total piston displacements of different engines designed with a constant stroke bore ratio are proportional to the cube of the cylinder bore. For instance, if the bore of an engine is b and its stroke is $1.667 \times b$, the piston displacement of this engine per cylinder is:

$$b^2 \times \frac{\pi}{4} \times 1.667 \times b = 1.309 \times b.$$

The explosive impulses of different engines are proportional to the square of the cylinder bore, providing that the same compression is used throughout. Denoting the bore of a six cylinder engine with b_6 and that of a twelve cylinder engine with b_{12} we find for two engines of equal total piston displacement the following relation:

$$6 \times 1.309 \times b_6^3 = 12 \times 1.309 \times b^3_{12}$$

From this follows:

$$b_6 = \sqrt[3]{2} \times b_{12}.$$

The explosive impulse E of an engine is proportional to the square of the cylinder bore. Between the explosive impulses of a six and twelve cylinder engine exists, therefore, the following relation:

$$\frac{E_6}{E_{12}} = \frac{b^2_6}{b^2_{12}}$$

When substituting for b_6 the valve given in equation 3 we obtain:

$$\frac{E_6}{E_{12}} = \frac{(\sqrt[3]{2})^2 \times b_{12}^2}{b^2_{12}} = \frac{(\sqrt[3]{2})^2}{1}$$

In practice, we find, invariably, that the small bore engine is

(*Continued on page 984*)

Methods of Wing Trussing Compared

Proposed Basis of Comparison Depending Upon the Relative Air Resistances of Unit Length of Strut and Unit Length of Bracing Cable

IN a recent issue of *Flight* some space is devoted to consideration of the problem of wing trussing. It is assumed that a designer is faced with the problem of designing a machine to fulfill certain given conditions, and that in order to do this he finds that, with the power and wing section at his disposal, he requires an area of 265 sq. ft. In order to get the best possible results out of his machine with the area, wing section and power given, assuming that the form of body has been decided upon, the designer will naturally ask himself, What is the best wing bracing to give the least resistance and still provide adequate structural strength?

Fig. 1 shows diagrammatically the front spars with wire bracing of a standard scouting biplane. Although a stagger is almost universally employed in modern scouting machines, the vertical type has here been chosen, as it is simpler to deal with. This is entirely permissible, as the sole object is to compare different forms of bracing. The free length of spar, viz., 8 ft. 3 in., is almost too great for strong construction, but the proportions conform approximately to actual practice. The top plane attachment is of the type called canopy mounting by the Germans.

In the table accompanying Fig. 1 there is given a resistance factor, and this factor requires an explanation. For comparing various wing bracings of scout type machines it is necessary to assign to each component of that bracing a value for resistance. It is only necessary to know how the resistance of a unit length of strut compares with that of a unit length of wire. From the reports published by various institutions on wind tunnel experiments it would appear that a No. 10 smooth, round wire has approximately the same resistance per running foot as a good section strut of the dimensions employed on a machine of the scout size and type. Since, however, in modern airplanes, at any rate in high-speed ones, round wires are never employed, it will not be fair to assign to the struts the same resistance factor as to the wire. The so-called stream line *RAF* wire is not generally favored by private designers for various reasons. A method preferred by many is to use duplicate cables placed about 1 in. one behind the other and having a wood filling between them. Although this combination does not give a true stream line section, its resistance probably is as small as that of an *RAF* "stream line" wire the section of which also is not of perfect stream line form, and it will be considerably stronger, especially against sudden loads, as when flying in a "bumpy" wind. If such a combination of cables measures ½ by 1½ in. while the strut section measures 1¼ by 4 in., in view of the less perfect section of the cables, the resistance per foot of the struts will be about twice that of the cables. It is admitted that this ratio is arbitrary, but it cannot be far wrong, and the designers of practically every airplane plant must have in their possession experimental data enabling them to check up this assumption.

Referring again to Fig. 1, the resistance factor 184 is arrived at by multiplying the length of the struts by two and adding the total length of wires or cables. This forms the basis for comparison.

In Fig. 2, illustrating the Halberstadt scout biplane, two pairs of interplane struts are used on each side, and the top planes are attached to a cabane instead of to the canopy usually found on British scouting machines. The total length of cable is 183 ft., as compared with 128 ft. in the standard scout, and the total length of struts is 50 ft., as compared with 28, making the resistance factor 283 instead of 128. This would considerably reduce the performance of this type of bracing. It should be pointed out, however, that this bracing is much stronger, on account of the shorter free length of spars. The reason for its adoption in the Halberstadt biplane is to be sought in the fact that a heavy water cooled engine is fitted, whereas most, or at least many, British scouts are fitted with light rotary engines. For light engines the standard bracing is therefore more efficient.

From the standard bracing as shown in Fig. 1 was developed the bracing shown in Fig. 3, which was first introduced by the Sopwith Aviation Co. and has since been employed by many others. It differs from the standard only in the placing of the body struts supporting the center section of the top planes. Instead of forming a vertical continuation of the body struts proper, they slope outward a few degrees. The total length of wire is the same as in Fig. 1, while, owing to the outward slope of the struts, the total length of struts is 1 ft. greater, which results in a resistance factor of 186 as against 184. This difference is negligible, when by sloping the struts outward the free length of the upper spars, the more heavily loaded ones, is reduced, thereby strengthening the machine.

Fig. 1—Diagram of the wing bracing of a standard scout

Type Scout	Upper wing	Lower wing
Span	28 ft. 0 in.	28 ft. 0 in.
Chord	5 ft. 0 in.	5 ft. 1 in.
Area	140 sq. ft.	125 sq. ft.

Total area, 265 sq. ft. Gap, 5 ft. 0 in. Total length of struts, 28 ft. 0 in. Wires, 128 ft. 0 in. Resistance factor, 184.

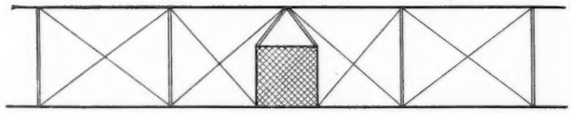


Fig. 2—Diagram of the wing bracing of a Halberstadt biplane

Type H	Upper wing	Lower wing
Span	28 ft. 0 in.	28 ft. 0 in.
Chord	5 ft. 0 in.	5 ft. 0 in.
Area	140 sq. ft.	125 sq. ft.

Total area, 265 sq. ft. Gap, 5 ft. 0 in. Total length of struts, 50 ft. 0 in. Wires, 183 ft. 0 in. Resistance factor, 283.

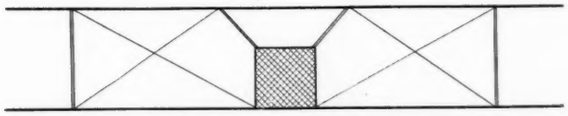


Fig. 3—Diagram of the wing bracing of a Sopwith type scout

Type S	Upper wing	Lower wing
Span	28 ft. 0 in.	28 ft. 0 in.
Chord	5 ft. 0 in.	5 ft. 0 in.
Area	140 sq. ft.	125 sq. ft.

Total area, 265 sq. ft. Gap, 5 ft. 0 in. Total length of struts, 29 ft. 0 in. Wires, 128 ft. 0 in. Resistance factor, 186.

G. E. Co. Develops Thermostatic Metal

Curves Given Show Variation of Deflection with Temperature, Length and Thickness of Metal. Also of Force Exerted and Force Required to Produce a Permanent Set, with Thickness of the Metal

THE development of G-E thermostatic metal by the General Electric Company has put a new means for accurate control of cooling and electrical systems into the hands of automobile and accessory manufacturers.

This metal is so susceptible to temperature changes that a change of one degree will curve or straighten it and always to the same extent. It may be used for temperatures as high as 500 degrees Fahr. By changes of shape it will make and break electrical contacts and even exert a force.

Its present use as a means of temperature regulation in furnaces, incubators and refrigerators, together with its non-corrosive characteristics, suggests its possibilities in carbureter manufacture as a means for mixture control as the motor warms up for regulation of circulating water in water jackets and to regulate the relative charging current delivered to the storage batteries in warm and in cold weather.

As a result of its responsiveness to change of temperatures and the mechanical force developed, this metal is used to actuate various mechanisms which tend to neutralize either the temperature change or its effect upon devices.

G-E thermostatic metal consists of two strong non-corrosive metals possessing a wide difference in coefficients of expansion, the widest difference possible for any known stable combination of metals. These two metals are firmly attached to each other throughout their entire length so that there is absolutely no slip of the one upon the other. Thermostatic metal can be cut, stamped or pressed into practically any desired shape, and when annealed will have all its original inherent qualities; moreover, it will not deteriorate nor take permanent set under applications of heat or force within definite practical limits. The metal is manufactured in various standard thicknesses ranging from 0.25 to 0.015 in., maximum width of 6 inches and maximum length of 36 inches.

The deflection per degree temperature change besides, being quite considerable as shown by curve B Fig. 1, is a constant for any definite piece of the metal, as will be seen by referring

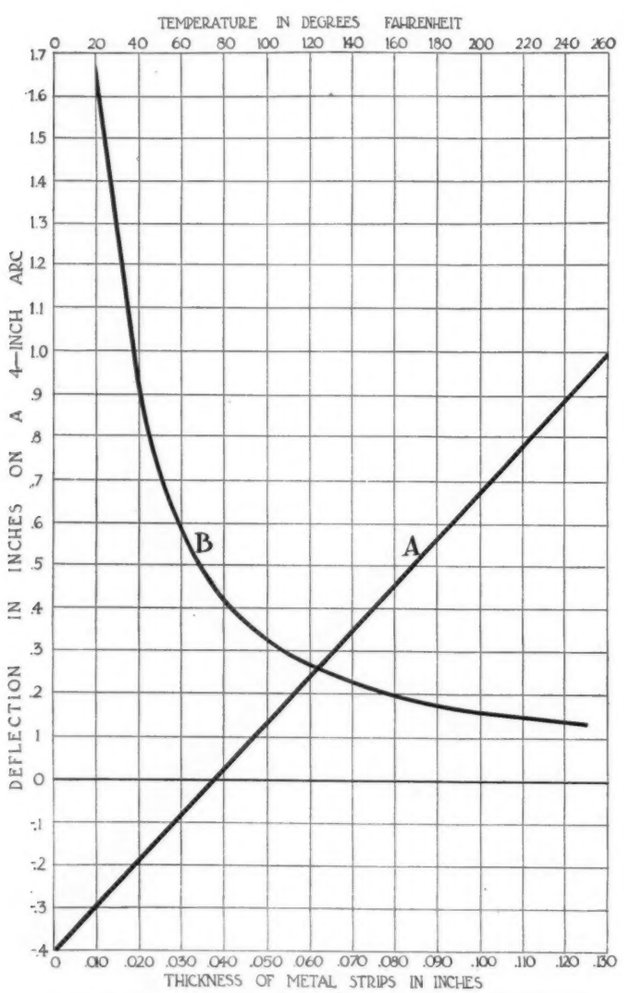


Fig. 1—A, Deflections obtained at different temperatures; size of strip, 4 in. long, 5/16 in. wide and 0.030 in. thick; B, Deflections obtained with different thicknesses of thermostatic metal for a temperature change of 100 deg. F; size of strip, 4 in. long and 5/16 in. wide

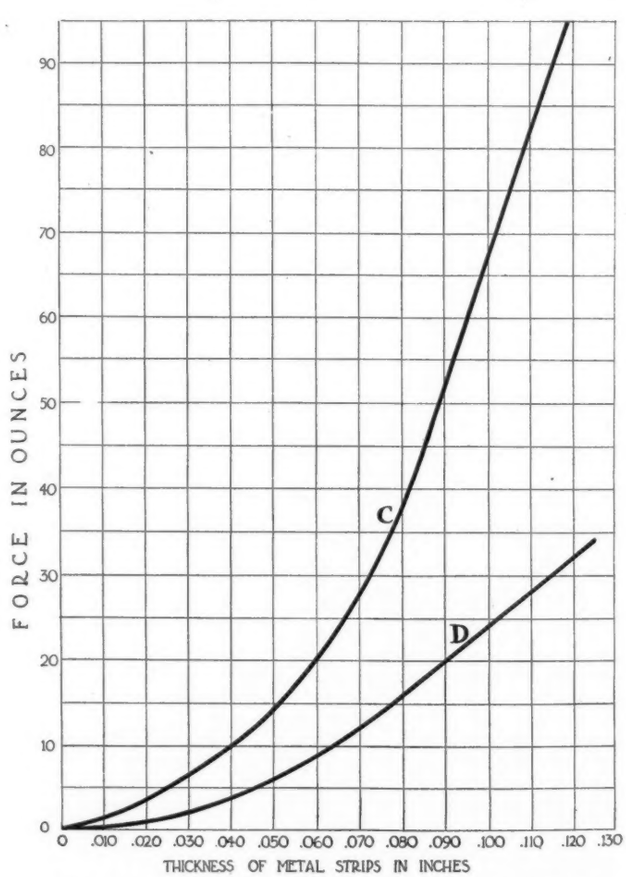


Fig. 2—C, Force exerted by thermostatic metal of different thicknesses; D, force required to effect permanent set in metal of different thicknesses; size of strip, 4 in. long, 5/16 in. wide; temperature change, 100 deg. F.

to Fig. 3, since a definite and considerable opposing force is necessary to cause the metal to take permanent set. (See curve D, Fig. 2). The metal can be depended upon when used in devices where extreme accuracy is required.

If the curving of thermostatic metal on heating or cooling is opposed, the metal will produce a mechanical force (see Curve C, Fig. 2), which is limited only by the force required to produce permanent set, Curve D. For example, Curve C shows that a piece of thermostatic metal one-tenth of an inch thick, 5/16 in. wide and 4 in. long will exert a force of 24 ounces (1½ lb.) on being restrained from bending when subjected to a temperature change of 100 deg. Fahr. This curve illustrates the law that the force exerted by this metal varies as the square of the thickness, directly as the width and as the square of the temperature.

Other curves given illustrate the deflection resulting as one of the two dimensions, length or thickness, varies with a definite change in temperature. The width of the piece has no influence on the deflections resulting from temperature change. From these curves it will be found that the deflection for any given temperature change varies directly as the square of the length of the piece of thermostatic metal and inversely as the thickness of the piece. As previously pointed out the deflection of any piece of metal varies directly as the temperature change.

G-E thermostatic metal is used in the products of many different industries owing to the fact that it can be successfully worked into different shapes and forms. In some of its applications it is used to actuate mechanisms directly by means of the force developed within itself when its tendency toward assuming a curved shape is restrained. In other applications it is used to close and open electrical circuits by means of which various devices are operated.

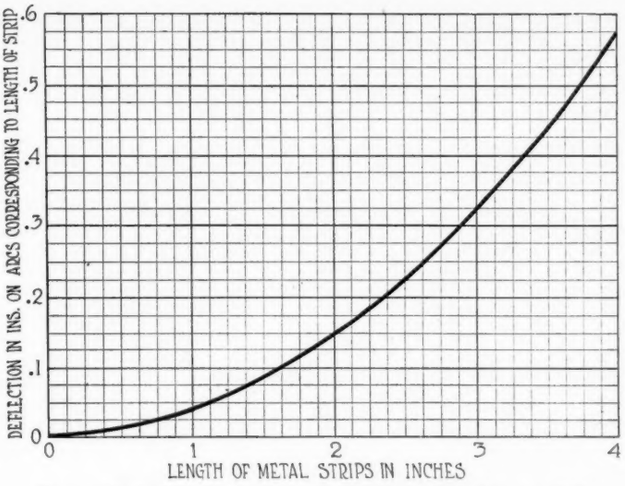


Fig. 3—Deflection obtained with different lengths of strip for a temperature change of 100 deg. F; width of strip 5/16 in., thickness 0.030 in.

Thermostatic metal is a product of the Ft. Wayne, Ind., works of the General Electric Company where the desirability of a metal with its characteristics arose from necessities in the construction of certain types of electric meters. This metal fully met the requirements and it has since been adopted by other manufacturers who had thermostatic and heat compensation problems to solve.

Fuel Supply Trebled by Dry Gas Vaporizing*

Automotive Engines Can Be Made to Use 50 Per Cent Instead of Less than 20 Per Cent of Crude Oil—Dry Gas Vaporizer More Economical Than Wet Mixture Carbureter—No Great Change in Engines Needed—Disposes of All Cooling and Lubrication Troubles

By W. P. Deppe

IF any man can suggest a method of engine design or improvement in carburetion whereby it is possible to use half kerosene mixed with half gasoline, and operate like true gasolines, it means ultimately doubling motor engine fuel, without increasing production of crude oils, or seriously altering existing oil refineries. It adds 55,000,000 barrels per year to existing gasoline production.

If any man can suggest a method of engine design or improvement in carburetion whereby it is possible to secure 50 per cent more miles per gallon in commercial trucks and pleasure cars, it results ultimately in effect on the gasoline shortage so called. It is as though new oil wells were discovered able to give 50 per cent more crude oils.

Adds 55,000,000 Barrels

It adds another 55,000,000 barrels of motor fuel annually to existing production through increase of miles per gallon over present averages.

If any man can demonstrate such methods as commercially developed, and by agreement beginning on the first of January, 1918, or any other future date, all new cars, trucks, tractors, etc., and even aeroplanes, were equipped to handle not only half kerosene and half gasoline mixtures, but could also handle with the same operating ability of true gasolines a low-grade motor fuel oil consisting of 50 per cent to 40 per cent of all crudes; and allowing that in five years all existing vehicles will be worn out or become impossible to operate on such low-grade fuels, but are in the meantime replaced by better engines and vehicles, it would mean with the cracking methods suggested by the Bureau of Mines that oil refiners could almost triple the production of what is now motor gasoline, consisting of but 18 per cent of crudes produced in the world. That means nearly 200,000,000 barrels per year of motor engine fuel oils acting like true gasoline would be available.

It seems to the writer to be an economic wrong of the first magnitude to pursue methods and use mechanisms with operating ability in motor vehicles which limit the oil refiner in the production of what is known as commercial gasoline to less than 18 per cent of the total crude oil production of the world. He is only limited by carburetion methods now in use, his refinery capacity and ability being ahead of demands for refined oils and crude production.

Also it seems an economic wrong, which must ultimately be corrected, whereby prices which oil refiners load onto the output of so-called gasoline produce must represent nearly, if not all, of the net earnings of the present-day oil refiners, while selling a large portion of the 82 per cent of crude oils for less than cost of raw materials and overhead charges, as seems to be the case in the business of oil refining generally.

*Extracts from paper read to S. A. E. Metropolitan Section Nov. 22. 1917.

All nations have reached the point where, as in the case of the steam engine, means and methods must be devised and considered for immediate application, which will have the effect of not only producing more crude oils from existing or possibly new fields in the world, but effort should be made to devise means and methods of securing more than 18 per cent of the desirable refined oils out of the crudes in the oil refineries for motor fuel, and what is the main theory the writer is endeavoring to suggest in this paper, the securing of more useful work out of each pound of fuel oil used in internal combustion engines of any type. All cars now average less than 12 miles per gallon of gasoline. This average can be nearer 18 to 20 miles per gallon by better carburetion means, using mixtures of half gasoline and half kerosene or distillates and low-grade motor fuels, as will be explained later.

Likewise, trucks average about 4 to 5 miles per gallon and can be made to go 6 to 8 miles. Tractors using 3 to 4 gallons per hour can be made to run on 2 to 2½ gallons per hour, etc.

Four-cycle stationary engines can be made to show Diesel engine fuel economy, using kerosene and distillates. Four-cycle engines cost about $10 to $15 per horsepower, and Diesel engines from $50 to $75 per horsepower.

Cracking Methods in Use

Before we can suggest exact improvements in engines and oils and oil refining we must consider some things not clearly brought out as a rule.

Oil refiners can now use in large commercial operations the following general types of cracking methods whereby it is possible to increase the production of so-called gasoline:

First. Cracking oils as liquids with heat and pressure.

Second. Cracking oils in vapor state with heat and pressure.

Third. Cracking oils by the addition of steam or hydrogen, etc., in both the liquid and vapor states with heat and pressure.

Fourth. Cracking oils in the superheated gas phase by adding steam and using pressure and temperature which causes partial combustion in the distilling plant.

Conditions Not Fixed in Carburetion

In a gas engine, with its carburetting system and distribution of the mixture to the various cylinders measured in inches, with varying throttle openings and varying engine speed at any given throttle opening, according to the variation of load to be overcome, there is now no fixed control of pressure, temperature and time limit; in fact, the carbureter, intake system and distributing passages as well as within the cylinder at least on the intake stroke, the mixture must be handled in a partial vacuum varying from slightly less than atmospheric pressure to as much as 25 in. of mercury, according to the throttle and engine speed, type of engine, etc., and then enters the problem of pressure of compression, which raises boiling points of oils, same as the oil refiner does it while cracking oils, at a time when it is all important to hold the mixture in a dry gas state. Compression pressures vary with throttle openings also.

Superheated Fixed Dry Gas

The object of carburetting oils and air is to produce not merely atomized or foggy state of the fuel oil in air, not merely vapor state of the fuel oil in air, but should be *dry* gas mixed with *superheated* air at pressure below atmosphere, up to the bottom of the intake stroke, when pressure begins the same as the oil refiner has it in his stills; excepting that this pressure is not fixed but increases on the compression stroke to the moment of top center when the electric spark is supposed to ignite same. Again this compressed mixture must not be stratified, but must have some of the lighter hydrocarbons mixed with the medium hydrocarbons, and both mixed with some of the heavier hydrocarbons, and all of these mixed in air in such a way that each hydrocarbon molecule is in physical contact with oxygen. No combustion in any combination of gases can be maintained without the presence of oxygen, properly diffused and brought to the firing temperature.

Men may devise gas producers using mineral oils whereby through applying high heat to the liquids or even using temperatures high enough to cause a partial combustion in the gas producer to make superheated dry gases, but not necessarily homogeneous fixed dry gas mixtures in cylinders, when they attempt to transfer such superheated gas to the intake manifold, the valve chambers or even into the cylinders themselves, where additional air supply is furnished. They are baffled by the loss of power and low fuel economy, lubricating oil dilution, etc., and perhaps do not realize that the expansion on intake stroke of the piston acts like a condensing chamber in the cracking methods of the oil refiners as already mentioned herein, and pressure of compression raises the boiling points and causes precipitation of heavier hydrocarbons at some engine speeds and throttle openings.

Many men do not realize that the time limit is so short for the movement and mixing of air and oil between carbureter and cylinder, it is not an easy thing to make superheated homogeneous fixed dry gases in any device which will allow the mixture to maintain itself as a superheated dry gas to the bottom of the intake stroke, so that the compression stroke will not waste its heat in merely partially vaporizing the liquid fuel oil more or less mixed with the lubricating oil, as now is the case with present wet mixture carbureter methods and present-day low volatile and large average of heavy hydrocarbons, known as commercial gasolines.

Further, in the short time limits in high-speed engines, where heat alone is used, temperatures high enough to make kerosene, and fuel air supply, for instance, into a superheated homogeneous fixed dry gas before actual combustion takes place in the cylinder, is destructive to the molecules in the lighter hydrocarbons of gasoline, naphtha, and perhaps lighter benzine, etc., if improperly applied.

It seems to the writer that engines appear to be designed as dry gas engines, but are being operated with present-day gasolines as semi-Diesel engines, in fact; owing to not having the advantage of the high compression of the Diesel type of engine, which has pressure, temperature and time limits fixed, fuel economy possible with the Diesel engine types is not obtained in the present low compression engines suitable for handling so-called commercial gasolines of to-day equipped with wet mixture carbureters.

It is the writer's impression that gas engines should be designed with a leaning toward the gunpowder theory of high force being developed initially at dead center of piston, at moment of highest compression, instead of the attempt to follow the practice of steam expansion as typified by the Diesel and semi-Diesel types of engine. Diesel engines apparently do their best work when the engine speeds are relatively very low in comparison to the multicylinder low compression high-speed throttle-controlled engines, as used in the present-day power vehicles.

Palliatives Exhausted

It is no permanent solution of a disagreeable problem to suggest curtailment of the use and production of pleasure cars or to suggest a painfully small possible saving of gasoline in the hands of 5,000,000 gas engine users by stopping so-called leaks, incidental to the very use of gasolines in routine life.

Prophecy is a dangerous pastime for anyone, but if the present world-wide war lasts much longer, economic necessity will ultimately compell some military dictator to prohibit the sale of any motor truck or passenger vehicle, using oil fuels which do not show at least 75 to 80 ton-miles on ordinary roads per gallon of fuel consumed running at an average speed of 10 m.p.h. Such a vehicle should show 40 to 45 ton-miles per gallon on an average speed of 20 miles on similar roads. That military dictator will find to ultimately win this World's War, so far as the Allies are concerned, that he cannot simply demand the fuel oil necessary for military purposes and tell the rest of the world to "go hang and do without." There will be no need for the military fuel if all other supplies fail to reach the men at the front. The weakest link in the complete transportation establishment of the Allies, as a single fighting unit, which it must be to win, regulates absolutely the movement and volume of raw material from the source to its consumption on the battlefield. The weakest link now unsettled or not provided for is the wet mixture carbureter method.

Tires from the Viewpoint of Riding Qualities

(*Continued from page 957*)

The better riding qualities of the cord tire are due chiefly to the fact that it will carry a given load with less air pressure than a fabric tire. Mr. Wolfe showed a table of carrying capacities of different size tires with different inflation pressures. In this no definite carrying capacity is given for any size of tire. The load capacity increases with the inflation pressure carried, but, of course, if the tire is inflated very hard it will not ride comfortably. The greatest capacity in any vertical column is the limiting load that should ever be placed on the tire, but the smallest figure in the column is nearer to the ideal load for that size of tire. Mr. Wolfe explained that the riding qualities can be improved by the use of exceedingly large tires inflated to very low pressures, but this is not good practice because the operating cost per car-mile increases rapidly and the power consumption also increases.

Fitting More Liberal Sized Tires

Car manufacturers were strongly advised to equip their cars with tires in accordance with the table of load capacities. They were told that if they used smaller tires their cars would either be hard riding or else would be tire-eaters. As a matter of fact, during the 1915 and 1916 seasons a considerable percentage of all cars were under-tired. Manufacturers, however, especially those in the high class field, are seeing their mistake and are fitting more liberal sized tires. Mr. Wolfe also considers it an unfair deal to the purchaser to fit over-size tires as regular equipment, as this makes it impossible for the owner, if he is dissatisfied with the life or riding qualities of his tire equipment, to fit a larger size of tire without also changing his wheels.

It was explained that the manufacturers of cord tires are building easy riding qualities right into the tires, and these tires also have long life, as they are really oversized and allow of the air pressure being reduced 10 per cent. The over-all diameter of the tire is not a big factor as regards riding qualities. Of course, a wheel of large diameter will not drop into a chuck hole as deeply as a smaller wheel, but on improved roads this is no factor. The diameter of the wheel is really a matter for the decision of the car manufacturer, rather than the tire manufacturer. Smaller wheels are coming into favor because of the demand for low-hung cars and also no doubt because a tire of smaller diameter is less expensive. In former years, when large wheel diameters were used by a number of manufacturers, the chief object really was to increase the road clearance at the middle of the car, but at the present time, purchasers of cars are not insistent upon a high clearance. In Europe wheels of small diameter (32 in.) are in almost universal use.

In the discussion it was brought out that if a car is fitted with cord tires and fabric tires of the same size, and these are inflated to the same pressure, there is not much difference in the riding qualities. It is the lesser pressure permissible in the cord tires which results in better riding qualities. One man who changed over to cord tires was very much disgusted because the rear part of his car jumped around a great deal. He was advised to reduce the inflation pressure 15 lb. and then was well satisfied. It was suggested that the inflation pressures given by Mr. Wolfe were rather higher than those recommended by the Society, but this was denied, as the maximum pressures given in Mr. Wolfe's table were based on the figure of 20 lb. per in. width of tire and the ideal pressure generally ranged between 16 and 17½ lb. and in some cases was as low as 15 lb. per inch of width.

It was admitted that the inflation pressures called for by the manufacturers in their literature or on their tires were unduly high, and it was explained that the manufacturers deliberately gave rather high pressures because they knew the average user would not maintain these pressures. The old inflation pressures are still being put on the tires because the figures are cut into the molds and are difficult to eliminate. It was also pointed out that the figures given in the capacity table referred to the loaded weight of the cars, and the suggestion was made that car manufacturers in selecting their tire sizes often based their choice on the weight of the empty car.

In the table an inflation of 160 lb. per square inch is called for for the largest sized tires, and the question was asked how it was expected to obtain these pressures. Mr. Wolfe said that the Goodyear company on its pneumatically-tired trucks always carried an engine driven four-cylinder pump, which had proven fairly satisfactory.

Mr. Dayton said that he felt that 32 by 3½ in., which was now almost universally used in Europe on larger cars, would be the ultimate large-sized tire here. His company had been considering the proposition of going into the manufacture of solid tires, but they had reached the conclusion that all truck loads up to at least 3 tons would be carried on cord tires and therefore decided not to enter the solid tire field. A question was asked Mr. Wolfe why the 60 deg. bias cord tire had been discarded in favor of the 45 deg. To this he replied that the tests to determine the relative merits of these two constructions had been made prior to his connection with the company and that no written record of these tests was preserved, hence he was not in position to give a definite answer. When cord tires were first taken up, some four years ago, two different types were made, one for electric vehicles, in which the chief consideration was the utmost power economy, and one for gasoline vehicles, in which easy riding qualities and long life were more important considerations than power economy. The electric type of cord tire had the cord put on a bias of 60 deg. Apparently it was finally decided that there was not enough difference between the two constructions to warrant the continuation of two types, and the electric type was abandoned. A great many tests were made on tires of different types by means of a resiliometer, which was in reality a power consumption meter. Mr. Wolfe admitted, however, that practically all laboratory tests on pneumatic tires so far evolved were poor guides in judging the qualities of the tires.

Bouncing Tire Tests

W. H. Jenks, of the Marathon Tire & Rubber Co., stated that bouncing tests made on cord and fabric tires showed the former to bounce from 33 to 40 per cent more than fabric tires and also to keep on bouncing for a longer time. J. W. Watson suggested that the fact of one tire bouncing higher than another showed that it had compressed more. Mr. Jenks stated that his company did not publish any fixed inflation pressures, but cautioned owners that the tires must be pumped up until well rounded out. It was suggested that this would be rather risky, but Mr. Jenks said that they had not found it so. The Goodrich company supplies a caliper for determining the proper inflation of the tire.

Mr. Wolfe was asked whether any difficulty had been experienced with the 35 by 5 in. tire (which is the oversize for 34 by 4½ in. rims) overhanging the rim. It was explained that this tire has the same section as the 36 by 5 in. and the rim or base of the tire therefore is comparatively narrow. Mr. Wolfe said that his company had made experiements with tires of widely varying width of base, and in plotting the curve of tire life against width of rim they had found that there was a certain width which made the tire most durable. If the base was made too wide the side walls of the tire, down to the base, were practically straight, and extra strains were imposed upon the tire structure, whereby its life was reduced. Too narrow a base also cut down tire life. The curve, however, was rather flat over its middle portion, and this covered the present standard practice.

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Union Aircraft Engine Four Stroke

THROUGH an error in our November 15 issue the aircraft engine of the Union Gas Engine Co. was referred to as a two stroke machine. As described in the Oct. 4 issue of AUTOMOTIVE INDUSTRIES, this engine is of the four stroke type, and, in fact, the Union Gas Engine Co. during a period of 33 years has manufactured none but four stroke engines.

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The AUTOMOBILE

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Super-Induction Aircraft Engines

WHAT may be regarded as the standard type of aircraft engine of the present is the four-stroke engine with atmospheric induction. It would seem that this type of engine has been developed to a very high degree and but little further gain in weight efficiency is to be expected from it. Some engineers believe that good results could be obtained from the practice of super-induction or forcing into the working cylinder more charge than it can pump in itself when in direct communication with the atmosphere. All engines when giving their maximum output have a volumetric efficiency of only 70 per cent or less, and as they must be built to stand the explosion of a complete or 100 per cent charge, they are not working to the best advantage. In aircraft engines operating at high altitudes the conditions are still worse, and the volumetric efficiency may drop below 40 per cent; which is to say that the amount of air taken into the cylinders at each suction stroke is less than 40 per cent of the piston displacement volume of air under atmospheric pressure at sea level.

It has been held that super-induction is impracticable because even with atmospheric induction it is difficult to prevent preignition. This would be true if the compression ratio—that is the ratio of the combustion chamber volume at the end of the compression stroke to the volume at the beginning of this stroke—remained unchanged. In practice, however, the compression chamber volume would be increased so that the compression would be no greater than with atmospheric induction. There would then be the same explosion pressure, but as the piston moved away from the top end the pressure would be maintained better in the super-induction engine, hence its mean effective pressure would be greater.

Super-induction, of course, requires the provision of a charge pump, which may be either the crank chamber, an annular space below the working cylinder of the engine or an entirely separate pump, possibly of the centrifugal type. Whatever form the pump had, it would add some weight and the amount of this weight would be one factor in determining the value of the engine. It must be conceded that, since the ability of aircraft to operate and carry loads at altitudes where barometric pressures are down about one-half is an important demand, the principle looks very attractive. For instance, if by means of super-induction an engine operating at 20,000 ft. altitude could be made to take a 70 per cent charge, instead of a 35 per cent charge, which seems not at all impossible, the gain would be enormous.

One disadvantage of the super-induction principle, and which would make it unsuitable for long-range machines, is that the fuel economy is inevitably somewhat reduced, as the engine works virtually at a low ratio of expansion.

Trucking on Pneumatic Tires

IT has been known for some time that tire manufacturers were endeavoring to introduce pneumatic tires for commercial vehicles of the larger capacities, but their faith in the future of the pneumatic in the truck field has probably never been so strongly expressed as at the Pennsylvania Section meeting of the S. A. E. last week. The tire makers fully realize that they cannot equal the life, dependability (or freedom from tire trouble) and low mileage cost of the solid tire with the pneumatic, but the capacity of the truck for doing work is so much enhanced by the use of pneumatic tires that it is believed the ton-mile cost, which is the really important factor, can be greatly reduced.

If it is decided to fit pneumatic tires, quite radical changes in truck design will have to be made. It can readily be imagined that pneumatic tires 10 or 12 in. wide will be very efficient in protecting the truck against road shocks and quite high speed will be permissible. Even though the speed is higher, it should be possible to make the dead weight of the truck for a given load lower. The higher speed would be an important factor, especially in long hauls, and in this line it is not inconceivable that the work done by a truck of definite capacity might be

doubled. This would at once reduce the labor cost per ton-mile 50 per cent, and the interest and depreciation charges the same, the latter possibly even more. Just how much the fuel consumption per ton-mile could be reduced is conjectural, but it does not seem that the chance for economy is anywhere near as great here as in connection with the labor, depreciation and interest items.

In city traffic the greatly increased speed possibilities of pneumatic tired trucks could not be taken advantage of. In fact, there is considerable complaint now that trucks are being driven at dangerous speeds. However, the reduction in the upkeep cost alone might make pneumatic tires worth their cost, for the punishment of a solid tired truck on cobble stone pavement even at present speeds is very severe. Another factor is that with increase in speed, whether in the city or country, the danger of accidents increases. Yet, while objections may be urged against the use of pneumatic tires, the advantages which they hold out seem to far overshadow anything that may be said against them.

Automobile Labor

MEMORANDA are being issued from various departments at Washington all aimed at securing the best possible conditions for labor employed on government work. They lay stress on the poor efficiency of long hours, on the advantages of comfortable working surroundings and on a variety of detail matters appertaining to both of these subjects.

Probably the most important points are the insistence on the evil of continual overtime and on the justice of arranging wage scales with regard to the increased cost of living.

These notices bear out the spirit of President Wilson's speech to labor at Buffalo, when he promised that if labor stood by the country it should not lose anything by doing so.

The automobile plants which will between them do much direct war work are mainly in a very happy position in that they are mostly new buildings provided with all the modern conveniences and comforts. In the automobile industry efficiency has been studied far more intently than in most other businesses. Employers and labor alike are accustomed to working in several shifts, have studied lighting and heat and ventilation, and have probably done more than any other branch of engineering work in finding out how women can be organized with best advantage to themselves and to the employer.

No doubt automobile plants will have their problems, but we believe that they can teach others much more than they will have to learn.

British Tractors

THE future of the British tractor industry is very difficult to forecast, and ideas in England seem to be very indefinite. The modern farm tractor is a new machine with which America has obtained a big lead, owing partly to war conditions. Probably had there been no war the tractor would have developed much faster in the United States just the same.

However, at the end of the war we shall see the American tractor industry firmly established and its product known all over the world. Any competitor will have a hard fight for recognition and even if strong tariff preference is shown British machines in British colonies, it must be years before British makers can supply the demand.

A very probable outcome is the establishment in Canada or in England of factories where tried and proved American machines will be built under the name by which they are already known. For all concerned, co-operation between the two countries is better than competition. It is better to be able to sell quantities of tractors to, say South Africa, cheaply, by utilizing a combination of American experience with British material and labor, than to load the American product with a heavy duty and make the South African either pay excessively for a real necessity or wait several years for British machines in quantities.

For this reason high duties on tractors after the war are not to be expected immediately, but if a British industry shows signs of getting on its feet it is not improbable that tariffs will be raised.

It must not be forgotten that the food problem will not end with the war. It will take years after the war to restore food supply to normal. It means the reorganization of large countries, the building of shipping, the restoration to agricultural work of many men now fighting. Also there will be a general tendency to let up, to ease off after the great stress of past years, which will be bad for food production.

Thus the tractor's importance will not be diminished by the coming of peace. Rather will peace furnish the opportunity for still more intensive cultivation after the present difficulties disappear.

Metal Wheels

THE wheel situation is approaching a time when the public will have to be educated to the wire or metal wheel. It is becoming more difficult each year to secure the proper grade of hickory to make wood wheels, particularly for the heavier low-priced cars. The results are that considerable wheel shrinkage occurs and the wheels become noisy and generally unsatisfactory.

Cases have been frequently noted where wheels have shrunk and distorted so much that the rims creep around the felloe band to such an extent that the valve stems on the tires are sheared off. The expanding wedge locks used in the demountable rims cannot always be depended upon to take up the slack due to the wheel distortion; in fact they should not have this function at all, but should merely retain the rim upon the wheel.

The wire wheel and the all-metal wheel are just as good in appearance as the wood wheel. The use of them is simply a matter of proper education and if a larger number of stock cars used metal wheels as regular equipment there would be a sufficient amount of hickory to supply those who wanted something special.

Latest News of the

Will Discuss Liberty Engine

Four Prominent Engineers to Give Reasons Back of the Design

NEW YORK CITY, Nov. 27—"The Reasons Behind the Liberty Engine" has been scheduled as one of the leading engineering subjects to be considered by the Society of Automotive Engineers at its winter meeting in New York, on Thursday afternoon, Jan. 10. Major Jesse G. Vincent, who was largely responsible for the design of the engine and now in charge of its development at the aviation headquarters in Dayton, Ohio, will present a special address going into the engineering reasons of the present twelve-cylinder Liberty engine. Instead of presenting a prepared address, which would have to be completed several weeks in advance, Major Vincent is going to deliver a comprehensive talk which will bring the question of aviation engineering up to the last minute.

After Major Vincent has handled the subject a special discussion will follow. It will be opened by Col. Clark, who is chief in charge of aviation engineering in the Signal Corps. His phase of the discussion will have to do with military requirements of aviation engines.

Following Col. Clark, Capt. Howard Marmon, who made an extensive investigation of aviation engineering in Europe some months ago, and who is now engaged in aviation engineering work with Major Vincent at Dayton, will talk on the engineering comparison of the Liberty engine as compared with European practice.

The discussion will be further carried out by H. M. Crane, engineer of the Simplex company, who has had a great deal of experience in the building of European aviation engines during the last year. His subject will have to do with adapting European engines to American methods of manufacture. Mr. Crane's talk should disprove of so many rumors floating around regarding how easy it is to bring an engine from Europe and start producing it in quantities in America. Mr. Crane is so thoroughly posted on all questions of aviation engine design that he is well qualified to discuss the Liberty engine from a designing and a manufacturing viewpoint.

"The Reasons Back of the Liberty Engine" will only constitute one portion of the afternoon program on Thursday, Jan. 10. An equally interesting subject along another line of engineering activity will comprise the remainder of the program.

Tickets for the Automobile Industries Dinner, to be held at the Hotel Biltmore, New York, on Thursday evening, Jan. 10, are selling rapidly. Already checks for 281 tickets have been received at S. A. E. headquarters.

Tickets for the War Dinner to be held in Chicago, Friday evening, Feb. 1, at the New Morrison Hotel, are selling well. To date checks for 214 have been received at headquarters.

The Chicago program for the afternoon session of Friday, Feb. 1, which is the Friday of Chicago show week, will largely deal with tractor problems. Several very important papers from tractor engineers are already in course of preparation for that meeting.

Read the Story on Steel *See Page 948*

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Continental to Make Class B Truck Engines

NEW YORK, Nov. 26—The Continental Motors Corp., Detroit, has received an order for engines for the Class B U. S. A. standardized army trucks. It is understood that the order calls for the production of 360 engines in January, with an increasing monthly production until a total of 6000 engines have been delivered.

.7 of 1% Alloy Steel Only Needed

Automobile Industry Could Get Along With Almost Minute Quality

DETROIT, Nov. 24—The automobile industry, if it had to, could manage with so little alloy steel that it would not have any trouble getting it. Normally, it would require 75 tons of alloy steel per 1000 cars produced. Cars of almost equal quality can be produced with 23 tons or less of alloy steel per 1000 cars.

If the automobile industry uses only 5 per cent of the alloy steels in peace time with large production, it will only use normally 2½ per cent with production 50 per cent off. If it can cut this amount down 70 per cent, which leading engineers say is very well possible, it will mean that the automobile industry will only require seven-tenths of 1 per cent of the alloy steel output of this country to make good cars.

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Maxwell Truck Prices Higher

DETROIT, Nov. 26—Prices of the Maxwell 1-ton truck have been revised as follows:

Model	Old Price	New Price
Chassis	$865	$985
With Cab and Windshield	900	1,025
Complete with Stake Body	955	1,080
Complete with Combination Box Stake Box	950	1,075
Chassis with Combination Box Body	915	1,035
Chassis with Express Canopy Top and Windshield	975	1,095

Light Used Cars in Demand

DETROIT, Nov. 23—A survey of the dealers in used cars made here indicates that heavy used cars are in very small demand. This has been a constantly increasing condition, but has become even more marked recently. Used cars of the heavy type in the 1915 series are on the market at prices as low as $150, and will not move at that price, and in some cases the best offer received for such cars amounts only to $85 for junk purposes. The buying public in the used car class want light cars; cars that do not require much upkeep expense, and this condition is tending to place a premium on cars in that class.

The shipments of light used cars to southern dealers is becoming more general. One used car dealer, the Motor Mart, whose greatest business in used cars is in southern quarters states, that the reason for the southern demand for light used cars is because of ease of shipment. New cars have to be shipped in good condition, and to do this requires the use of a type of freight car that is not readily available now. But the used cars can be shipped in anything. Drive-aways are exceedingly difficult to the southern cities.

A marked increase in the number of drive-aways in all the factories is noted. Dodge Brothers had a drive-away this week to Iowa and Nebraska, and about 150 cars are going overland from Flint every day. The dealers are furnishing their own drivers, as the factories are generally laying off their drive-away crews. But the outlet by drive-aways, and also through lake shipments is bound to close with the coming of winter.

In the new car field, locally the business is quiet, though no more so than it has been for the past few weeks.

Automotive Industries

Council of War for Country

Will Co-ordinate All Effort and Eliminate Conflicting Rulings

WASHINGTON, D. C., Nov. 27—*Special to Automotive Industries*—At a meeting of the Council of National Defense this morning, action was taken to bring about co-ordination of the war-making activities of the Government. A joint weekly conference of the Council of National Defense and Secretary of the Treasury McAdoo, Edwin N. Hurley of the Shipping Board, Food Administrator Hoover, Fuel Administrator Garfield, Chairman Daniel Willard of the War Industries Board and Director Gifford will be present. This co-ordinates the Council of National Defense, composed of Secretary of War Baker, Secretary of the Navy Daniels, Secretary of the Interior Lane, Secretary of Agriculture Houston, Secretary of Commerce Redfield and Secretary of Labor Wilson with the men mentioned.

This means that we will now have a war council, so to speak, and that the country's resources will be used in a more intelligent manner and that there no longer will be any such lack of co-ordination as will bring about the haphazard orders that were originally issued and which were contradictory between departments—for example, such an order as Priority Order No. 2, which conflicted with various other departments in the Government work.

This conference will also take up such matters as non-essentials, because in the future there will be such a complete co-ordination that some positive method of overcoming the obstacles of coal or gasoline shortage or like problems must be taken. The weekly conference will enable all departments to get together and discuss problems such as transportation, etc., and discuss them in a positive manner instead of in a negative manner. It is understood that Director Gifford of the Advisory Committee was responsible for this action.

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Taxi Rate Raised at Last in England

LONDON, Nov. 26—It has required over 3 years of war to bring about an increase in taxicab rates in London. In spite of gasoline selling at $1 per Imperial gallon the pre-war rate of 15 cents per mile has generally ruled until Nov. 1, when an extra charge of 12 cents per trip was authorized. Some sections of Greater London have refused to allow any increase in taxicab fares because of the higher price of gasoline and have recommended that taxis use coal gas. An innovation in connection with the use of coal gas for operating motor trucks and motor cars is the establishing in parts of London of municipal coal gas stations for general use of cars. These correspond to our curb-side gasoline stations.

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Stegeman in Process of Reorganization

MILWAUKEE, WIS., Nov. 26—A complete reorganization of the Stegeman Motor Car Co. is in progress. A. J. Mayer has succeeded Oscar Stegeman as president, the latter having resigned. Mr. Mayer was formerly treasurer of the Mayer Boot & Shoe Co. E. M. McLean has become sales manager of the Stegeman company. He was formerly advertising manager of the Four Wheel Drive Auto Co., Clintonville, Wis., and before then sales manager of the Armleder company, Cincinnati. L. S. Pease has succeeded L. G. Schertl as secretary and treasurer.

The new organization will continue to manufacture six-cylinder trucks, but will confine the line to 2, 3½ and 5-ton capacities, eliminating the 3, 4 and 7-ton sizes.

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Government Commandeers Tin

WASHINGTON, Nov. 27—Importations of tin held in storage in New York for later delivery have been commandeered by the Government and will be utilized for war purposes. The metal will be turned over where needed to companies having war contracts.

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Edison Storage Increases Capital

WEST ORANGE, N. J., Nov. 27—The Edison Storage Battery Co. has filed a certificate to increase its capital from $3,500,000 to $5,000,000. Twenty thousand shares of the stock are to be preferred of a par value of $100 each and 30,000 shares are to be common stock of the same par value.

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Dodge Capital Now $10,000,000

DETROIT, Nov. 26—Dodge Brothers has increased its capitalization from $6,000,000 to $10,000,000. Part of the increase will be used to defray the expense of the enlargement of the plant to take care of government orders.

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Detroit Material Situation Easier

DETROIT, Nov. 26—The material situation in Detroit is considerably easier at present and there is plenty of alloy steel in sight. The business of manufacturers producing assembled cars is holding up very well.

Military Highway from Detroit

Pathfinding Car En Route to Washington — Big Truck Drive-Away Next Spring

WASHINGTON, D. C., Nov. 24—A pathfinder car left Detroit this week en route for Washington and an Eastern seaboard carrying several army officers and a bridge engineer, under the supervision of the Highways Transport Committee, to determine the best military highway route from Detroit eastward.

This car, loaned for the purpose by the Lincoln Highway Association and driven by H. C. Ostermann, field secretary for the association, will travel through Ohio, Pennsylvania and other Eastern states and will be met at the border of each by the highway commissioners of the different states who will travel with the party to the following border of the state, making observations of bridge and road conditions and conferring with the army officers.

Two weeks hence, if the conditions are found satisfactory, a complete truck company such as will operate in France, and comprising twenty-seven cargo trucks, two gasoline tank trucks, one baggage and rations truck, one light repair truck and one officer's car will make the journey with seventy-six soldiers aboard to prepare the way for the drive-away next spring of the thousands of heavy-duty war trucks now planned for early assembly.

The Highway Transport Committee in addition to supervising this work has commenced first-hand investigation through several engineers of road and traffic conditions in various sections of the country where terminal freight congestion is severe. Plans are being formulated for the use of motor trucks at such points, and the railroads, extending full co-operation, plan to use the motor truck transportation to relieve their congestion wherever it occurs at points where short freight hauls can be taken up by motor truck transportation. Following complete investigations definite recommendations will be made both of the railroads committees and the Highway Transportation Committee.

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Kerosene for Export Advanced

NEW YORK, Nov. 26—The Standard Oil Co. of New York has advanced the price of kerosene for export 1 cent a gallon. At the same time the price of naphtha and gasoline for export in 100-gallon drums has increased 7½ cents.

No Sanctioned Racing During War

A. A. A. Votes to Discontinue Contests and to Suspend All Racing Rules

NEW YORK, Nov. 24—There will not be any more sanctioned racing in this country during the period of the war, or war exigency. The Contest Board of the A. A. A. voted this action at a special meeting held to-day at which representatives of nearly all of the speedways were present by invitation. The discontinuing of racing during the war is due primarily to the great demand for car drivers and mechanics in France.

Immediately after the Contest Board had taken such action and handed its report to the Executive Committee of the American Automobile Association, this latter organization accepted the report.

The Contest Board has suspended all contest rules. The offices of the board will be continued at 501 Fifth Avenue this city and Richard Kennerdell, who has been chairman for several years, will continue in that position along with the present membership of the board.

The official action of the board was taken in the following resolution:

"Whereas the country is in a state of war in which our entire available man power is needed for national activities; and

"Whereas the national need for skilled workmen in numbers greater than it is possible to furnish such is urgent; and

"Whereas the national need for mechanics, automobile drivers and others skilled in the care and maintenance of motor apparatus, that is laying such a leading role in the present war, is imperative; be it, therefore,

"Resolved, That it is the sense of the Contest Board of the American Automobile Association that it will not sanction motor car contests during the period of war exigency and that during the aforesaid period the rules of the Contest Board shall be suspended."

This action of the national motor sport governing board is in accord with the Royal Automobile Club of Great Britain, the Automobile Club of France, the Automobile Club of Italy and other European organizations. These foreign bodies are being notified of the A. A. A. action so that after the war international regulations governing motor car racing will be resumed.

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Great Britain's Fuel Problem

LONDON, ENG., Nov. 1—The fuel question is a most important war problem with the industries of Great Britain and it has already resulted in the very greatly increased use of electrics for business delivery and also of gas as a fuel. In addition to the increase in price, gasoline or petrol as it is designated here, can only be supplied on a license. As gasoline is sold here in 2 gal. cans, which are easily stored and easily handled, it would seem that a profit of 20 cents for handling 10 gallons or 2 cents per gal. should be sufficient and that the retailers asking 10 cents a gallon are taking advantage of an unfortunate situation.

The business house using gasoline vehicles has difficulty in obtaining gasoline substitutes and unfortunately kerosene has to be obtained by license the same as gasoline. In normal times there are ample supplies of benzol obtained from coal, the present production of benzol being estimated at 80,000,000 gallons per year, or very little less than the total automobile fuel consumption of the country. But to-day benzol is taken by the Government for non-motoring purposes so that none is available for motor uses.

Each week sees an increasingly large number of vehicles operating on coal gas which is carried in tanks on top of the motor trucks. In general use it is found that 1 gallon of gasoline can be replaced by 250 cubic ft. of coal gas, from which can be readily calculated the capacity of gas containers necessary for different services. Unfortunately gas bags made of canvas with an interior coating of rubber proof material are necessary for carrying the gas, whereas if steel containers could be obtained it would be possible to compress the gas into such cylinders and carry these alongside of the frame or in other places. As all the steel is necessary for the war, the industry has to be content with the canvas gas bags.

The price of this gas varies very considerably throughout the country. In the North of England near the large coal fields it sometimes sells as low as 25 cents per 1000 cu. ft. and increases in some places to 75 cents per 1000 ft. But at the 75 cent rate the actual cost of the gas is equivalent to gasoline at 25 cents per gallon. Where coal gas can be obtained at 25 cents per 1000 ft. its value as a fuel is equivalent to gasoline at 8 cents per gal. Imperial gallon, which is 1/6 larger than the standard American gallon. Due to this low price it is possible that after the war coal gas may be quite extensively used for bus service and other vehicles used on short runs where the trouble of filling the gas containers would not be a difficult problem.

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Newark Is Out for Cash

NEWARK, Nov. 24—The Garage Trade Assn. of America, an organization of Newark garagemen, held a meeting today, at which the question of operating a garage on a strictly cash basis was favorably discussed, and the indications are that some or all of the members will shortly put this plan into operation, either as individuals or as an association. This matter will be the main topic of interest at the next meeting, which is scheduled for Dec. 4.

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Dart Appoints Pittsburgh Agent

PITTSBURGH, PA., Nov. 26—The Dart Motor Truck Co., Waterloo, Iowa, has appointed the Jackson Sales Co. as distributing agent for Dart trucks in western Pennsylvania with headquarters and salesrooms at 5915 Penn Avenue, Pittsburgh, Pa. Its territory also includes the four Eastern counties of Ohio and northern West Virginia.

Familiarize Hands With War

National War Work Council Conducting Intensive Campaign in Factories

JACKSON, MICH., Nov. 23—The National War Work Council is conducting an intensive campaign among the manufacturing institutions in this city, and local manufacturers are being solicited in a systematic and vigorous manner.

The following petition was submitted to all of the concerns: First: We will assign, when requested by the manufacturer's committee, 20 minutes of time during which we will shut down work at the factory and have the employees assembled where a speaker can present the matter, the time to be arranged by the subscriber and the factory committee to the best mutual advantage.

Second: We will arrange for an organization comprised of factory foremen and department heads to solicit subscriptions from employees.

Third: We will make the necessary provision for collecting from payrolls such subscriptions as the employees may authorize us to make and the remitting of the same to the War Work Council:

Briscoe Motor Corp.
Jackson Metal Products Co.
Lockwood-Ash Motor Co.
Walcott Lathe Co.
Jackson Machine Tool Co.
Sparks-Withington Co.
Michigan Seating Co.
Jackson Motor Shaft Co.
Alloy Steel Spring & Axle Co.
American Oil Co.
Riverside Machine Co.
Frost Gear & Forge Co.
Fox Machine Co.
Hayes Wheel Co.
Alloy Steel Spring Co.

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Abnormal Railway Traffic Problem to Be Solved

WASHINGTON, D. C., Nov. 26—Action of vital interest to the automobile industries of the country in connection with the present freight congestion situation has been taken by operating officers of the Eastern lines. There has been created a committee which will be in full charge of the railway pool ordered by the Railroads War Board. This committee will sit continuously at Pittsburgh until the entire traffic problem produced by the abnormal war business in the district East of the Mississippi and North of the Potomac and Ohio Rivers has been solved.

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Madison Has Used Car Week

MADISON, WIS., Nov. 24—The Madison Automobile Dealers' Association of Madison, Wis., observed the week of November 11–17 as "Used Car Week." Every member put used cars to the forefront in display windows and other places during the period and many sales thus were effected. It is stated that used car business has been particularly stimulated by the fear that the production of new vehicles doubtless will be reduced.

Ford Produces 3000 Cars in 1 Day

800,000 Cars Expected to Be Produced by the End of November

DETROIT, Nov. 23—On the 20th of this month the Ford Motor Co. struck the highest point in its production, manufacturing on that day 3000 cars, and it is expected that 800,000 cars will be turned out this month. Any question as to the effect of munitions manufacture upon the normal production is answered by comparing the production figures of the first 3 months of the present fiscal year with those of last year.

Year	August	September	October
1917	52,719	69,989	75,372
1916	22,667	45,850	56,628

The rumor that the Ford Motor Co. is going to restrict or entirely stop passenger car production crops up in a new form each day, but executives at the factory state that the company hopes to carry on all necessary Government business without interference with the passenger car production. It has more than done this in the past, as shown by the above figures.

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Mechanical Engineers to Discuss War Problems

NEW YORK, Nov. 24—At its annual meeting, which will be held in New York Dec. 4-7, the American Society of Mechanical Engineers will have for its dominant theme the Engineer's Part in the War. On Wednesday, Dec. 5, there will be a so-called keynote session at which different problems of the engineering industries connected with the war will be dealt with. Papers will be read by the following on automotive subjects: Prof. L. P. Breckenridge, The Fuel Problem; Wm. P. Kennedy, Motor Transportation; Major L. B. Moody, Army Transportation; Prof. W. F. Durand, The Aircraft Problem.

On Tuesday evening honorary membership in the society will be conferred upon Major-General George W. Goethals. The ceremony will be accompanied by an address by the Hon. William H. Taft, ex-President of the United States.

Among the papers and reports to be presented that should prove of interest to automotive engineers are the following: The Steam Motor in the Automotive Field, by E. T. Adams (Wednesday afternoon); Recent Developments in Balancing Apparatus, by N. W. Akimoff (Wednesday afternoon); The Submarine, by C. H. Bedell (Thursday morning); report by Screw-Thread Tolerance Committee (Thursday morning).

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Commissions for Military Truck Board Members

WASHINGTON, Nov. 23—The following named officers, inspectors and other workers connected with the Military Truck Production Board, of which Christian Girl is chairman, have received commissions in the National Army, and will now work for the board under military orders:

Captain Carl H. Bowen, First Lieutenant Donald G. Small, First Lieutenant Frank P. Gravelle, First Lieutenant George H. Adams, First Lieutenant Max Leroy Jeffrey, First Lieutenant Edwin A. Bayer, Second Lieutenant Edward R. Finkenstaedt, Second Lieutenant H. H. Smith, Second Lieutenant Alfred H. Johnson, Second Lieutenant Stanley Wardwell, Second Lieutenant J. G. Stephenson, Second Lieutenant W. O. Campe, Second Lieutenant J. E. Casse.

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Dodge Brothers Start Work on $1,500,000 Building

DETROIT, Nov. 24—As announced in the Nov. 1 issue of AUTOMOTIVE INDUSTRIES, Dodge Brothers have secured a large government contract for ordnance parts said to amount to $30,000,000 and had purchased a 40-acre factory site on Lynch Road near Mt. Elliott Avenue. Work has been started on building construction and permits have been secured. These call for a single story main building of brick and steel 575 by 820 ft. and a boiler house 50 by 150 ft. Smith, Hynchman & Grylls are the architects and it is expected that the cost will be about $1,500,000.

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War Trucks Pass 1500 Mile Mark

WASHINGTON, Nov. 23—The Class B heavy duty war trucks, which are now engaged in test drives near Washington, have passed the first 1500 miles of their tests without defect development of any sort. With the exception of interruptions in the service due to necessary changes in unit equipment for purpose of test there has been no stoppage for any reason in the grinding daily testing.

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Dayton Wire Wheel Granted License

BUFFALO, Nov. 24—The Wire Wheel Corp. of America, whose general offices are at Buffalo, N. Y., and which succeeded to the business of the Houk Manufacturing Co., has granted a license under its basic patents to the Dayton Wire Wheel Co., Dayton, Ohio, to manufacture wire wheels for motorcycles, airplanes and Ford automobiles. The Standard Roller Bearing Co., Philadelphia, Pa., and the Hayes Wheel Co., Jackson, Mich., are also operating under licenses covering these patents.

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Hudson Prices $300 to $475 Higher

DETROIT, Nov. 23—The prices of the Hudson Super-Six models, manufactured by the Hudson Motor Car Co., are revised as follows:

Model	Old Price	Increase	New Price
7-pass. Phaeton	$1650	$300	$1950
4-pass. Phaeton (formerly the Speedster)	1750	300	2050
Runabout Landau	New model	...	2350
Four Door Sedan	New model	...	2750
Touring Limousine	New model	...	3150
Limousine	2925	475	3400
Limousine Landaulet	3025	475	3500
Town Car	2925	475	3400
Town Car Landaulet	3025	475	3500
Full Folding Landaulet	New model	...	4252

Production Started on New Hudsons

Thermo-Syphon Control of Water Circulation—No Change in Specifications

DETROIT, Nov. 24—The new Hudson cars are just going through production and show a number of refinements. Probably the most important change is the addition of a thermo-syphon control of the water circulation. This does not control the shutter, which is still hand-operated, but maintains the water circulation at the proper temperature and in conjunction with the shutter gives complete water control.

The heated air intake is abandoned and in its place there is a plate which closes the louvres in the side of the bonnet so that when the front shutters are operated the carbureter is in an inclosed compartment which provides air of the necessary warmth. The air intake on the carbureter has been made of special shape to cut out the hissing sound of the intake.

The body of the touring car has been altered and now has a beveled line along the edge. There is 1¼ in. more room in the front compartment, the frame has been stiffened, being now 3/16 in. stock in place of 5/32 in. and being also ½ in. deeper. There is ¼ in. less camber on the springs, and throughout great care has been taken to make the car rattle-proof. The windshield supports are new and more rigid, the door locks are better, Marshall springs are used in the upholstery, the cowl is rounded slightly, the tires are carried on the sides, forward of the front doors and the spring hangers and shackles are now adjustable for wear. Collins curtains are also fitted.

No change has been made in the specifications of the car, but the color has been changed to a slightly lighter blue than a year ago. A white stripe is carried around the moulding of the body, on the louvres and at the frame ends. The phaeton, seven-passenger, sells for $1,950, f.o.b. factory. The four-door sedan sells for $2,750.

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Few Changes in Haynes for 1918

KOKOMO, IND., Nov. 26—The Haynes Light Six and Light Twelve are continued for 1918 with but few mechanical changes. The chief refinements are improved bodies and lines, stronger frames, and longer and more flexible springs. The bonnet is high-arched, the windshield tilted and the front fenders shaped to conform with the front wheels. The touring bodies are of the double-cowl type. A new four-passenger four-door roadster is added to the line. Convertible seven-passenger sedans, four-passenger coupes, and town cars are built in both the Light Six and the Light Twelve. The five- and seven-passenger cars have wheelbases of respectively 121 and 127 in., either of which can be obtained equipped with the six- or twelve-cylinder engine.

The Light Six engine is of the L-head type, cylinders cast in a block with a bore of 3½ in. and a stroke of 5 in. developing 50 hp. The inlet manifold is cast integral with the cylinder block being entirely surrounded by a water-jacket which maintains it at practically constant temperature thereby reducing condensation to a minimum. An exhaust manifold heater preheats the air before it enters the carbureter.

Hotchkiss drive is employed with underslung rear springs of the semi-elliptic type, 58 in. long and 2¼ in. wide. The front bushings and pins of the rear springs are made heavier to take care of the drive through the springs.

A few minor changes have been made in the twelve-cylinder engine, which has a bore of 2¾ in. and a stroke of 5 in. The rocker shaft of the valve mechanism has been increased in diameter and is made of hollow stock, the interior being used as an oil reservoir to lubricate the shaft bearings. The push rods are of larger diameter and made of tubing which gives lighter moving parts.

The six-cylinder open line includes a five- and seven-passenger touring car for $1,725 and $1,825, respectively, and a four-passenger roadster for $1,825. All open bodies have solid front seats.

The twelve-cylinder open cars include a seven-passenger touring and a four-passenger roadster for $2,785.

The coupes sell for $2,535 in the six and $3,385 in the twelve, and the sedans for $2,585 in the six and $3,385 in the twelve. The town cars are furnished in either the six or twelve for $3,250 and $3,985.

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Few Changes in 1918 King

DETROIT, Nov. 24—Few changes are incorporated in the King cars for next season. The present model has been refined to the extent of stiffening the rear structure of the chassis in the vicinity of the tire support. A cross member has been added behind the gearbox and there will be channel brackets added at the rear cross member. Other than this the car will be the same as the model E-17. There will be a price change also, which will be announced shortly.

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Racine and Simmons Boat Companies Merge

RACINE, WIS., Nov. 24—The Racine Boat Co. and the Simmons Boat Co., Irving Park, Chicago, have effected a consolidation and merger of interests and control in order to facilitate the execution of extensive Government contracts for power boats. The Racine yard will continue to make boats up to 50 ft. in length, and the Chicago yard craft of 50 ft. or longer. Ned Simmons, chief engineer and designer, has been elected vice-president of the Racine company and will supervise both yards. He is noted as a designer of high speed water craft, among his achievements having been the Disturbers built for Commodore Pugh of Chicago. Fred W. Herman continues as president of the Racine company, but O. M. Godske retires as vice-president.

M. & W. Tests Truck Tires

4288-Mile Trip to San Antonio and Back to Detroit—Fabrics and Cords Used

DETROIT, Nov. 23—Morgan & Wright, the Detroit factory of the United States Tire Co., has been experimenting with pneumatic truck tires for some time and has completed a test on a 1½-ton Packard having 2¾-ton load.

The trip through which the test was made was from Detroit to San Antonio and back, the run south being made on fabric tires and the one back on one fabric and three cord tires. The right front tire not only went through the entire southern trip without a break, but also stayed on through the entire 4288 miles. Not one tire was punctured on the way back from San Antonio to Detroit, 1862 miles, with the going almost as bad as on the way south.

Throughout the trip average daily mileage was 98 miles, and on the return trip an average of 8½ m. p. g. of gasoline was attained and an oil record of 33.42 miles per quart. In the sands of Texas the lowest figure was 5.36 m. p. g. of gasoline, and the best 8.58 m. p. g.

Among other interesting figures obtained on this trip is the mileage and gasoline record from Nashville to Louisville. It is 203 miles, 40 of which are over rough cobblestones, and the truck covered the distance in 12 hours. The average m. p. g. for this strip was 10.6. On the fine cut roads from Bowling Green to Louisville mileage of 11.7 m. p. g. was obtained.

The return trip was made in 19 days with a load of 3000 lb., which is the truck's capacity. First Lieutenant J. W. O'Mahoney and H. J. White, United States Tire engineer, supervised the test.

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Two-Ton Truck Maker for Graham Bros.

NEW YORK, Nov. 24—Graham Bros., Evansville, Ind., will manufacture an attachment selling at $585 that will make a 2-ton truck out of any passenger car chassis, according to announcement at its first annual convention here at the Hotel Knickerbocker on Nov. 21. The new product is built on the same lines as the Ford attachment it has been producing for the past 9 months. A Torbensen axle is used. The attachment is adjustable to any chassis frame by means of two plates bolted into the member's cross frame.

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Japanese Commission Inspects Automobile Industry

DETROIT, Nov. 22—Members of the Japanese Commission are in this city on an official mission to inspect the automobile industry and to investigate automobiles and trucks from a military point of view. Their reports to the Japanese war office will be an influential factor in the automobile subvention bill.

This commission is likewise making an investigation of road conditions in this country, and it is stated that Japan intends to devote a great deal of time and money to the building of good roads in the next few years. Among the members of the commission visiting Detroit are: K. Murata, engineer of the Japanese Army; Captain K. Midzutani and Captain T. Iwaki, both of the Japanese Military Automobile Committee; Kanaye Fujita, of Mutsui & Co., Ltd., Tokyo; T. Shibato, of the Japan Motor Car Co., Tokyo; G. Misoguchi, Sale & Frazar, Ltd., Tokyo.

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Rubber Assn. to Study Airplanes

AKRON, Nov. 23—At a meeting of important men of the Rubber Association of America with H. S. Firestone, president of the association, a resolution was passed to appoint a committee to determine the manner in which the association could aid the Government in war. It is the aim of this association to study the construction and utilization of aircraft in large numbers and to act in accord with any conclusion derived by this committee.

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Packard Tests in Florida in December

NEW YORK, Nov. 23—De Palma will probably go after the 1 mile and hour records in Florida in December, according to present plans. He will use the 300-in. Packard that broke the 6-hr. record recently and Bill Rader's 265 hp. Packard, which holds thirteen records from the ¼ mark up to 10.

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Detroit Employment Applications Increase

DETROIT, Nov. 24—According to various employment agencies, there has been an increase in applications for employment in the past three weeks of about 4 to 5 per cent. This is stated to be entirely normal at this time of year, due to the fact that outside men desire inside employment during the winter months.

The Kincaid agency, which handles about 1800 men daily, states that the turnover in the automobile field is not exceptionally increased and that the demand for skilled labor is still as good as it has been in the past. At present there is a premium on efficiency and time-study men, as well as on skilled mechanics of any kind.

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Hegginbottom Discusses Thermal Losses

FLINT, MICH., Nov. 21—Walter G. Hegginbottom of the engineering department of the Buick Motor Co. addressed the members of the Automobile Technical Society on the thermal losses and operation of the gasoline engine in cold weather.

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War Work Specifications Ready

DETROIT, Nov. 24—The Board of Commerce of this city is acting as clearing house for local manufacturers and the War Department at Washington. J. H. Cullen, industrial secretary of the board, has returned this week from a

trip to Washington and will spend some time in co-ordinating the various manufacturing plants with the Government's requirements. Specifications and blueprints of the materials required are at hand at the Board of Commerce, and these will be given out completely and in part to the various manufacturers capable of handling the same.

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Mason Tire Sales Total $1,200,000

KENT, OHIO, Nov. 26—Sales of over $1,200,000 were reported at the annual meeting of the Mason Tire & Rubber Co. Net profits amounted to $181,504.36. The balance to be placed in surplus amounts to $104,330.22 after deductions for 1916 profit and loss amounting to $23,328, income tax reserve of $5,076, preferred dividends paid during 1917 and preferred dividend reserve totaling $48,485.40.

The surplus for the year amounts to very nearly 20 per cent on the common stock and would have exceeded 25 per cent except for the 1916 loss incurred during the first few months of operation of the plant, which started but 90 days before the closing of the 1916 fiscal year.

The following directors were elected for the current year: O. M. Mason, D. N. Mason, R. W. MacKinnon, M. B. Mason, J. H. Diehl and D. M. Mason.

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New Theft Insurance Rates

NEW YORK, Nov. 26—Theft insurance is to be materially altered Feb. 1, 1918. At its annual conference the National Automobile Underwriters Conference tentatively adopted a form of reduced value theft policy which will be sold at reduced rates. Present theft policies are to be continued at present rates except in certain cities of over 200,000 population where the policy providing for reduced coverage and at a reduced rate will be sold.

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Packard Motor Car Co. declared regular quarterly dividend of 1¾ per cent on the preferred stock, payable Dec. 15 to stock of record of Nov. 30.

Security Prices Are Higher

Strength Shown Along Whole Line—Gains of from a Fraction to 8 Points

NEW YORK, Nov. 24—Automobile and allied securities took a turn for the better this week, probably on account of the favorable war news and also because of promise of Government contracts.

Chevrolet, General Motors, Maxwell, Peerless and Standard Motor were strong. Peerless, which has been inactive for some time, gained 5 points on reports that the General Vehicle plant of the Peerless company had been sold for $2,500,000. The proceeds from this sale would be sufficient to retire the Peerless company's entire note issue of $5,000,000, the amount received being equal to the present market value of the stock.

General Motors showed gains in all its stocks. This company has received large Government orders, a report of which appeared in this paper last week. Chevrolet was strong at 62 to-day, a gain of 8 points for the week.

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Ford Subscribes to Canadian Loan

FORD, ONT., Nov. 24—The Ford Motor Co. and Henry Ford have subscribed $1,000,000 to the Canadian Victory Loan, bringing the total for Essex County up to $3,000,000.

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Detroit Ordinance Would Stop Thefts

DETROIT, Nov. 22.—The council ordinance committee is considering an ordinance that will require every dealer in used cars or second hand supplies to obtain a license and report on all goods handled. In the past few weeks the thieves, particularly in the tire field, seem to have become more bold, and not satisfied with taking tires from parked cars, have broken into tire shops and cleaned out the entire supply. By the new ruling, the source of supply of all used goods could be traced, and any doubtful material questioned. It is estimated that the value of the cars, tires and supplies stolen each year totals almost $2,500,000, and that about 500 cars are stolen each month.

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Hayes Wire Wheel Represented in Philadelphia

PHILADELPHIA, Nov. 10—Brown-White, Inc., 2222 Chestnut Street, has been appointed sales and service representative of Castle & Kyte, Detroit, exclusive sales representative for the Hayes wire wheel.

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Detroit Kerosene Carbureter Opens Office

DETROIT, Nov. 10—The Detroit Kerosene Carbureter Co. has opened an office in the Kresge Building, with E. E. Schwarzkopf manager and J. W. Racklyeft as engineer.

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DIVIDENDS DECLARED

Goodyear Tire & Rubber Co., quarterly of $3 per share on common stock, payable Dec. 1 to stockholders of record Nov. 20.

Continental Motor Corp., 2 per cent on common, payable to stockholders of record Nov. 26 on Dec. 5. This amounts to $290,444 and leaves 2½ per cent to be paid in final quarter. President B. F. Tobin expects that 6 per cent in dividends will be paid for the fiscal year.

Portage Rubber Co., a regular quarterly of 3 per cent, payable Feb. 15 to stockholders of record Feb. 5, 1918. A letter has been sent to shareholders of the company stating that none of the $2,500,000 new common and $4,500,000 new preferred will be offered at this time. The stockholders at a recent meeting waived all rights on the preferred to be sold in the future. A new building and equipment program has been approved by the board of directors.

Maxwell Motor Co., quarterly of 1¾ per cent on first preferred, payable Jan. 2 to stock of record Dec. 10.

Automotive Securities Quotations on the New York Exchange

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co	48	50	—1½
*J. I. Case T. M. Co. pfd	..	78	..
Chalmers Motor Co. com	2	4	..
Chalmers Motor Co. pfd	..	50	..
*Chandler Motor Co	64	65	+2
Chevrolet Motor Co	62	66	+8
*Fisher Body Corp. com	20	34	—1
*Fisher Body Corp. pfd	75	80	..
Fisk Rubber Co. com	..	45	..
Fisk Rubber Co. 1st pfd	98	103	—2
Fisk Rubber Co. 2nd pfd	70	80	—5
Firestone Tire & Rubber Co. com	96	100	—2
Firestone Tire & Rubber Co. pfd	96	100	—2
*General Motors Co. com	92½	4½	+3⅜
*General Motors Co. pfd	75	77	+1½
*B. F. Goodrich Co. com	36	36¾	+1⅜
*B. F. Goodrich Co. pfd	91	93	—4
Goodyear Tire & Rubber Co. com	145	150	+3
Goodyear Tire & Rubber Co. pfd	93	96	+3
Grant Motor Car Corp	2	3	..
Hupp Motor Car Corp. com	2	3	..
Hupp Motor Car Corp. pfd	74	79	—1
International Motor Co. com	8	15	..
International Motor Co. 1st fd	30	50	..
International Motor Co. 2nd pfd	10	30	—4
*Kelly-Springfield Tire Co. com	41	43	+2
*Kelly-Springfield Tire Co. 1st pfd	77	83	..
*Lee Rubber & Tire Corp	11	12	..
*Maxwell Motor Co., Inc. com	24	25	+2½
*Maxwell Motor Co., Inc. 1st pfd	53	56	+1⅞
*Maxwell Motor Co., Inc. 2nd pfd	16	16½	+1¾
Miller Rubber Co. com	110	115	..
Miller Rubber Co. pfd	95	99	—2
Packard Motor Car Co. com	110	118	..
Packard Motor Car Co. pfd	92	96	—1
Paige-Detroit Motor Car Co	13	15	—1
Peerless Truck & Motor Corp	13	15	+5
Portage Rubber Co. com	103	107	..
Regal Motor Car Co. pfd	10	20	..
Reo Motor Car Co	16	17	..
*Saxon Motor Car Corp	5	5½	..
Springfield Body Corp. com	..	..	..
Springfield Body Corp. pfd	..	..	..
Standard Motor Construction Co	9¾	10½	+2¼
Standard Parts Co	..	80	..
*Stewart-Warner Speed. Corp	47½	49½	+2½
*Studebaker Corp. com	40	41	+ ⅞
*Studebaker Corp. pfd	..	90	..
Swinehart Tire & Rubber Co	..	26	..
United Motors Corp	16½	16¾	+1¼
*U. S. Rubber Co. com	51½	52½	+1¼
*U. S. Rubber Co. pfd	95	97½	..
*White Motor Co	36	38	+1
*Willys-Overland Co. com	18½	19	+ ¾
*Willys-Overland Co. pfd	69	71	+1
Wright-Martin	7½	7⅛	+ ⅜

*At close Nov. 24, 1917. Listed N. Y. Stock Exchange.

Industrial Review of the Week

A Summary of Major Developments in Other Fields

Coal Shipments Little Improved

Shipments, especially to tidewater, show little improvement. Only by extreme exertion can retailers even approximate keeping up with their orders. Many yards are bare and little coal is to be had. What coal is moving outside of contract obligations is quickly gobbled up by dealers anxious to secure even a small supply. So low have run the receipts of coal that in many instances drivers, salesmen and collectors have been laid off, the dealer preferring to take his chances of securing help when necessary and cutting down the immediate expenses to keeping his help when business is so slack that this help is utterly nonproductive. The City of New York recently closed a sizable contract at a rather high price. The penalty clause in the specifications is here relied upon to cut down the actual price paid to a reasonable figure. It is reported in many places that receipts of coal have been greater this season than a year ago, and it is consequently believed that many domestic consumers have considerable quantities in storage. This, however, does not apparently lessen demand, but it is thought that it will begin to do so by about the first of next January. The amount of anthracite already shipped to the Northwest doubtless appreciably exceeds the quantity sent to that region last year.

Need More Cars for Bituminous

The production of bituminous coal appears to be more dependent upon car supply than upon labor, although labor is doubtless scarce. Reports are heard from many localities that coal producers would be glad to sell fuel in the open market and at the Government's price, providing means of transporting it would be furnished by the purchaser. The car supply throughout the Indiana and Illinois field has been somewhat better recently, while in Pennsylvania districts it has been worse. Nowhere does this car supply appear to equal the demand. As to sizes, grades and quality, as well as price, few questions are asked. The consumer is so anxious to receive fuel that he is willing to take almost anything that will burn. Less is heard nowadays of the offering of prices in excess of Government regulations than was the case a few weeks ago. People are becoming reconciled to Government regulation and are trying to make the best of it. In several cities precautions have been taken to prevent suffering among domestic consumers. The dealer who sells in small lots is receiving particular attention. Also in many places single deliveries to householders seldom exceed one ton, and in some cases not more than one such delivery is made each ten days.

A New Service

¶ Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

The mild weather of the past week has done much to relieve and forestall actual suffering. Should it continue for a few weeks longer, there would be little danger of any great crisis this winter. The market is, however, taking the country as a whole, deluged with orders to such an extent that it is doubtful if deliveries on many of them can be made for weeks, or possibly even months, to come. With sufficient transportation to render possible continuous working of the mines, the present scarcity of fuel would soon be relieved.

Lake Trade Decreases

Shipments of coal by Lake have been growing less from week to week for some time. This process will doubtless continue until Lake navigation closes. It is believed that already more fuel has proceeded up-Lake than last year. The needs of the Northwest will thus be well cared for. During the past week many vessels after discharging iron ore proceeded up-Lake in ballast only, not waiting for coal loading. It has been urged that the season of navigation be prolonged as long as possible, even to the employment of ice breakers.—*Coal Age.*

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Asbestos Auto Hood Looking for Site

WILMINGTON, DEL., Nov. 26—The Asbestos Auto Hood & Capsule Container Co., Detroit, recently incorporated, is negotiating for property here for a new plant for the manufacture of compressed asbestos automobile hoods and bodies. R. T. Beyer, Charles Milligan and H. H. Valentine, all of Detroit, head the company.

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Four Drive Tractor Busy

BIG RAPIDS, MICH., Nov. 26—The Four Drive Tractor Co., Big Rapids, Mich., reports scheduled business for the balance of this year and for the ensuing year of 1918 which will take almost its output in full.

This business is all in the United States only, as foreign shipments have been turned down. Contemplating further business, more buildings will have to be erected in the early spring of 1918.

One-half of the output of the plant for 1918 goes to the Kansas City distributers, the K-C 4-Drive Sales Co., for its territory in the Middle West alone.

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Circus Trains Carry Automobiles

KANSAS CITY, Nov. 24—The local branch of the Oakland Motor Co. has alleviated its transportation difficulties by using circus trains to carry its cars from Pontiac, Mich., to this city. These circus trains have been idle for some time, and after being fitted out to carry automobiles were sent to Pontiac. They are going back and forth once or twice a month.

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Automobile Demand in Port Elizabeth

PORT ELIZABETH, SOUTH AFRICA, Sept. 15—There are probably 400 automobiles in this port and the greater number of these are American make. The majority of the machines sold in the Port Elizabeth zone reach people living in the country, rather than going to those in the city. Road conditions are not favorable although they are always passable except after heavy rainfalls. The coming of the automobile is resulting in a general improvement of the roads. To-day the automobile selling industry is in a very healthy condition and the problem is one of securing automobiles rather than any difficulty of selling them after they reach this port.

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Hartley Aircraft for Rock Island

ROCK ISLAND, ILL., Nov. 26—Removal of the Hartley Aircraft Co., Detroit, Mich., to Rock Island will take place as soon as quarters can be obtained here. Temporary offices have been opened at 1607 Second Avenue, and models of the various kinds of aircraft are on display. The company was organized several years ago and has enough Government contracts on hand to keep a large force employed for some time to come. After the war is over the company will construct air-propelled motor boats in addition to air machines. Negotiations are under way for the rental of buildings suitable for the purpose of the company but if nothing can be secured a lot will be bought and structures erected.

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American Grinder Breaks Ground

MILWAUKEE, WIS., Nov. 10 — The American Grinder Mfg. Co., 2302 Sycamore Street, Milwaukee, a large maker of tool grinders and sharpeners, has broken ground for a $30,000 factory addition, 85 by 120 ft., to be ready for occupancy about Jan. 1.

Allied Countries Restrict Use of Gasoline

Private Motoring Stopped in Italy—In France Supply Is Limited —Almost Impossible for Car Owner to Secure Any in England

PARIS, Oct. 25—Gasoline restrictions and automobile regulations are not uniform throughout the Allied nations of Europe. In Italy all private motoring has been stopped; in England restrictions are so tight that it is practically impossible for the car owner to get gasoline, and if he should find some means of procuring the precious fuel the police do everything possible to prevent him using it. In France the supply of gasoline is controlled and limited, but general conditions are better than in either of the other countries mentioned.

Italian motorists had been suffering from such a shortage of gasoline for several months that they were beginning to protest at having to pay taxes on cars they can not use. There were no official limitations, but gasoline was not allowed to get into the hands of retailers except in infinitely small quantities, and its price was nearly $2 a gallon. Just at the time automobile owners were preparing to protest, the Government issued a decree forbidding any but military cars on the road.

This hasty method allowed of no exceptions, with the result that for 24 hr. the big automobile factories of Turin and Milan (Fiat, Lancia, Itala, Isotta-Fraschini, etc.) found themselves unable to test their cars. As Fiat alone is producing 100 trucks and automobiles a day, and testing them all on the open road, army supplies were being seriously interfered with by this decree. On the mistake being pointed out to the authorities, they rescinded the law insofar as it concerned test cars but made no other concessions.

The heads of factories and high officials working on Government contracts were made to own their cars, and each one was given a military tag which was not recognized on the road Sundays. Taxicabs were not treated with any favor, and all those formerly in service in such cities as Turin, Milan, Rome, etc., have been withdrawn, and their drivers have sought employment in the automobile factories.

England Rationing Motorists

England has long been rationing her motorists, and has gradually been reducing the supply and withdrawing the gasoline cards until now the limit appears to have been reached in severity. A new law to go into force November 1 makes it an offense to use gasoline for any other than national business or in the public interest. This practically amounts to an embargo on motoring, for the few exceptions only cover such businesses and private interests for which the use of an automobile is indispensable, with the onus on the owner to prove the indispensability.

Under this new law automobile owners who used their cars in the service of the Red Cross and other charitable institutions and incidentally worked in a little personal business will find themselves eligible at any moment to be called upon to prove that they are actually doing work of public interest. In the interpretation of the act considerable discretion is vested with the police, who will have the power to hold up any car and question the driver's right to be on the road.

The only relief is to be found in the use of coal gas, of which, fortunately, England has a plentiful supply. Cars are being converted to carry gas bags on the roof or other suitable position and the necessary simple modifications made to deliver the gas to the carbureter. Owing to the difficulty of obtaining tanks, gas is not being used to any extent under pressure. The big size of the rubber containers limits the radius of the cars, for roughly 250 cu. ft. of gas are the equivalent to a gallon of gasoline.

Not many cars can be equipped to run more than 50 miles on one charge. While the roof is the favorite place for carrying the container, numbers of owners are using light two wheel trailers for the gas bag only. Under English conditions, with a liberal supply of coal gas and towns closely spaced gas can render very valuable service and its use is indeed being encouraged by the authorities.

Coal Gas Too Dear in Italy

In Italy, coal gas is impossible for automobile propulsion with coal at $200 a ton and the supply of gas very parsimoniously regulated. France is not interested, either, in coal gas, for while the cost of coal is very much less than in Italy the supply is strictly limited.

Under a multiplicity of regulations and an apparent severity French motorists have been much more favored than their neighbors across the channel and over the Alps. No car can be driven without a special local pass issued by the police; but this pass has been given freely on little more than proof of identity and honorability. For long distance traveling outside the war zone a special military pass was required, and although this was more difficult to obtain, the weakness of the system was that the lack of men prevented roads being guarded. Knowing this, many motorists did not trouble to apply for a pass and usually were able to finish their journey unmolested.

Every owner was entitled to 15 gal. of gasoline a week and usually could get this amount at an average price of $1 a gallon. Firms working for the government in any connection were more favorably treated and could draw even larger supplies. The distribution was not always regular throughout France. The Paris district generally was the most liberally treated, while the Marseilles neighborhood claims to be the least favored.

There are indications that this comparatively happy state of affairs is about to come to an end, for on November 1 stocks of gasoline and gasoline cans must be declared to the local authorities, and it is understood that on the same date supplies will be cut off in all cases where the use of a car is not absolutely necessary. The detail regulations have not yet been made known, but it is obviously impossible for French motorists to continue to receive more liberal treatment than those in neighboring countries. In England, France and Italy benzol and alcohol which before the war were good substitutes, are now unprocurable, all stocks having been requisitioned for making explosives.

Famine in Switzerland

Switzerland is feeling the gasoline famine more seriously than the belligerent nations, stocks being so low that all private use of automobiles has ceased.

Reports regarding Germany, coming through Switzerland, are to the effect that there is no gasoline shortage for army use, but the lack of rubber is causing serious trouble. A prominent member of the Swiss automobile industry, who has had opportunities of traveling in Germany, on many occasions since the war, declares that synthetic rubber has been more or less of a failure. Until America came into the war all kinds of methods were devised to smuggle rubber into Germany, and the attempts were so successful that at least all army staff cars could run on pneumatic tires. Of late the situation has been much less favorable, no rubber being available for trucks and while officers' staff cars are still running on pneumatic tires the stock is limited and every possible form of economy is exercised. With wood and steel tires in place of rubber, it has been necessary to reduce the speed of automobiles in all cases.

Trucks which could be run at 12 m.p.h. in the rubber days have been cut down to 10, 8, or even 5 m.p.h. The German army transport service has not been disorganized, but it has been rendered less efficient by reason of the great cut in speed.

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New Stephens Sedan and Sport Models

FREEPORT, ILL., Nov. 23—Little points of completeness in equipment set off the new Sedan and sport models of the Stephens Six, both of which are now ready for delivery. The sport model lists at $1,550 and the Sedan at $1,985. Particularly harmonious lines are found in each of these new bodies and both were designed and built in the shops of the Stephens Motor Branch of the Moline Plow Co., Freeport, Ill.

The sport model is a narrow body, four-passenger job, considerably lower than the standard touring car, which gives its speedy lines. The rear seat is finished with hand-rubbed black walnut, as is the instrument board. It has a drop door in the rear of the seat in which may be locked steamer rugs, blankets, etc. A semi-Victoria top is a special feature of the new line.

Goodrich Buys Coal Mines

Protects Itself Against Possible Shortage—Accidents Cut 20 Per Cent

AKRON, Nov. 23—In order to protect its plants from a coal shortage that might cause a shut-down, the B. F. Goodrich Co. has purchased the Wheeling Valley coal mines. These mines are in Bellaire, Ohio, and the entire output of the mines will be used by the Goodrich company. The cost was approximately $150,000.

At a recent report of the department of public relations of the company established 2 years ago it was announced that although the number of employees is now greater, the number of accidents has been cut down 20 per cent. The following is the report in brief:

"During the 2 years since then 6000 employees have been paid compensation during sickness; 3200 classes have been instructed by the bureau of education in primary studies; 16,600 students have attended the classes; 120 families of 120 deceased employees have received an average of $750 insurance each; 48,000 visits to sick employees have been made by Goodrich nurses; forty employees have been placed on the honor service roll, and are receiving service annuities; 176 men and women employees have received prizes for useful suggestions; although the number of employees now is greater than ever before the number of accidents has been cut down 20 per cent."

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187 Tons of Rubber for Goodyear

AKRON, Nov. 23—Recently one of the largest shipments of crude rubber ever assigned to an American firm came across the Pacific from Singapore, India, to Seattle, Wash. This shipment comprises 25,000 cases of plantation rubber weighing 187 tons and valued at nearly $3,000,000. It was consigned to the Goodyear Tire & Rubber Co.

Before the war American manufacturers received their crude rubber supply via London, as England controlled the rubber plantations and insisted on distribution from London. However, the Suez canal is now closed to American merchant trade and the Pacific Ocean presents the only open waterway. The amount of this trade is rapidly increasing and it is stated that during the month of August $5,000,000 worth of crude rubber business was handled in Seattle alone.

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Tire Factory for Georgia

SAVANNAH, GA., Nov. 26—The Doss Rubber & Tube Co. will locate its plant at Fort McPherson, near the new factory of the Hanson Motor Car Co. Work has been started on the plant. The company has purchased enough ground to build eight more buildings. The new building will contain 20,000 ft. of floor space and will be capable of turning out 1000 tubes and casings per day. Dr. C. F. Doss is president; T. J. Davis, vice-president, and W. B. Stovall, of Atlanta, secretary and treasurer.

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Dorris Making Foreign Shipments

ST. LOUIS, MO., Nov. 26—The Dorris Co. is making steady shipments of seven-passenger touring cars to France for use on the western war front. The cars are packed in special cases and according to military orders. The Moon Motor Car Co. is making regular shipments to Japan. In these shipments the bodies are packed separately from the chassis. The Moon Co. officials have been informed that the Japanese are making rapid progress in the work of widening the roads to make them available for motor travel.

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Ford Relieves Fuel Famine

DETROIT, Nov. 23—The Ford Motor Co. will relieve the fuel famine in Highland Park by supplying the residents with coke. Coke manufacturers supplying the company have been communicated with, and the first carload was received yesterday. This is being sold at $9.50 per ton.

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Coast Branch for Philadelphia

SAN FRANCISCO, Nov. 17—The Philadelphia Storage Battery Co. has opened a wholesale branch at 37 Spear Street here. A. P. Clark will be manager.

Weidely to Triple Capacity

$500,000 Increase in Capital to Take Care of War Work

INDIANAPOLIS, IND., Nov. 23—The Weidely Motors Co. yesterday increased its capitalization $500,000. The common stock was increased from $600,000 to $1,100,000. The preferred stock of $100,000 was not increased. George A. Weidely, vice-president of the company, said that increased capitalization was made necessary by the reason of the contract recently entered into with the Cleveland Tractor Co. for the manufacture of $3,000,000 worth of tractor motors. The increased capitalization will be used to increase the size of the company's plant and to purchase about $70,000 worth of new equipment. The company will erect in the near future a plant which will triple the manufacturing space of the present plant.

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Pierce-Arrow Earns $12.78 a Share in 9 Months

NEW YORK, Nov. 26—The Pierce-Arrow Motor Car Co. earned $12.78 a share in the 9 months ending Sept. 30, 1917, according to a statement to its stockholders. For the quarter ending the same time the company showed net operating profits of $1,809,729. From this there was deducted interest of $5,381 and plant and equipment depreciation of $117,333, leaving a surplus of $1,786,015. The surplus for the 9 months' period was $3,796,129.

These figures are after deduction of all taxes to which the company is now subjected, excepting Federal excess profits and normal income taxes, for which no deduction has been made pending the promulgation of regulations establishing the manner in which such taxes are to be calculated.

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Kelsey Wheel Adds

DETROIT, Nov. 24—The Kelsey Wheel Co. is to erect a one-story storage shed 100 by 140 ft. at 1736 Military Street.

Analysis of Crankshaft Stresses

(*Continued from page 968*)

working under somewhat higher compression. This results in a higher explosive force per unit of piston area. To give an example, we may assume, for the two types of engines to be compared, that the large bore six cylinder engine may work with a compression pressure of 85 lb. per sq. in. and the small bore twelve cylinder engine with 90 lb. Substituting this in the above given relation, we obtain:

$$\frac{E_s}{E_{12}} = \frac{85}{90} \times \frac{(\sqrt{2})^2}{1} = 1.5 \text{ to } 1.$$

From this we learn that within a certain standard of engineering the explosive impulse of a six cylinder engine is about 1.5 times as large as that of a twelve cylinder engine of equal total piston displacement.

In conclusion a few more words may be said about lubrication although this may be considered a problem all by itself. To obtain absolutely satisfactory conditions the oil delivery to the bearings must be in direct proportion to the work converted into heat by the bearings. We should lay out a series of diagrams as previously discussed, for different engine speeds and for different power output. The values of $p \times v$ obtained from the various diagrams would give us a clear picture how the oil delivery should be regulated. A scientific oiling would eliminate scraper rings and thus permit of lighter pistons. It would further eliminate sooted spark plugs, carbonization and preignition and would permit of higher compression.

First Company to Make Cars in Mexico

MONTEREY, MEXICO, Nov. 26—If the new company, Fabrica de Automoviles, which was recently formed under the laws of Mexico with principal offices here, is successful in carrying out its plans the first automobile manufacturing plant to be established in this country will be in operation within the next few months. The company has a capital stock of 600,000 pesos, which is equivalent to about $300,000 United States money. Luther L. Lane of Brownsville, Texas, promoted the organization of the company and he is its acting president. Among its larger stockholders are a number of the wealthiest business men of Monterey and Northern Mexico. J. G. Zambrano of Monterey, business associate of Nicaforo Zambrano, Governor of the State of Neuvo Leon, is acting secretary and treasurer.

It is stated that the company will build a plant here for the manufacture of the bodies, chassis and other parts of automobiles and their assembling.

It is claimed that the rapidly growing demand for automobiles in Mexico makes the proposed industry a very inviting proposition. The fact that there are located in Monterey a large iron and steel plant and foundry and that it is near to the sources of supply of crude and refined guayule rubber and other materials that enter into the manufacture of automobiles will enable the manufacture of the motor vehicles at low cost, it is pointed out.

New Companies Formed

Latest additions to ranks of Automotive Industries

WAUSAU, WIS., Nov. 26—The National Auto Wheels Corporation of Wausau, Wis., has been organized by E. J. Coerper, Robert R. Steritzky and M. Philopp of Wausau, to manufacture wood and steel wheels for all types of motor vehicles. Definite plans are now being completed. The company has a capital stock of $50,000.

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WILMINGTON, DEL., Nov. 24—The Roach Automobile Rotary Safety Brake Co. has been incorporated to manufacture safety brakes with a capital of $1,000,000. The incorporators are Mahlon Van Booskirk, H. R. Heyl and A. P. Stevenson.

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OSHKOSH, WIS., Nov. 26—The Oshkosh Auto Jack Mfg. Co. has been organized here by William Koeck to manufacture a simple device for keeping cars from garage floors when standing for extended period. The device will be made in sets of four and operates by a single push of the foot to raise or lower it. A factory has been established in the Libbey Building at Oshkosh.

Northern Foundry Co. Starts Working Dec. 1

MARINETTE, WIS., Nov. 26—The Northern Foundry Co. has been organized with a capital stock of $25,000 by Milwaukee, Racine and Marinette interests to establish a foundry for the production of castings for motor vehicles, agricultural implements and gas engines. The company has leased the foundries of the former Marinette Iron Works and will begin operations Dec. 1. S. D. Drew has been engaged as general superintendent. It is stated that a large part of the output will be taken by the J. I. Case T. M. Co., Racine, Wis., manufacturing Case cars, tractors and other agricultural machinery.

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DETROIT, Nov. 21—The Automatic Screw Machine Co. has been incorporated here for $25,000 by J. H. Mailhot, B. I. Mailhot and E. L. Olney to enter manufacturing.

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DETROIT, Nov. 21—The Locke Pattern Works has been incorporated here for $15,000 by D. H. and Mary R. Locke and T. E. H. Black. The company will make automobile patterns.

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WILMINGTON, DEL., Nov. 24—The Ebert Tractor Co. has been incorporated under Delaware laws with a capital of $5,000,000 to manufacture tractors. The incorporators are F. A. Armstrong, Wilmington, and Charles M. Egner, Elkton, Md.

Michigan Drop Forge Co. Absorbed

PONTIAC, MICH., Nov. 24—The Michigan Drop Forge Co., a Michigan corporation, has been absorbed by the Michigan Drop Forge Co., a Delaware corporation, and steps have been taken for its dissolution. The name of this company was originally the Pontiac Drop Forge Co.

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Fifth Avenue Bus Net $582,636

NEW YORK, Nov. 24—The Fifth Avenue Coach Co. in the fiscal year ended June 30 earned a net of $582,636, an increase of $139,539. The amount collected in 10 cent fares was $2,208,076. The number of passengers carried during the year was 22,080,760, compared with 16,223,042 in the previous year.

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Aeronautical School for Ohio State University

COLUMBUS, OHIO, Nov. 24—A school for military aeronautics has been established at the Ohio State University. A new building is being erected which will be used for laboratories and recitation rooms. Barracks, capable of housing 400 aviation students, are also being erected.

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800 Lane Trucks Ordered

KALAMAZOO, MICH., Nov. 24—The Lane Motor Truck Co. has secured a contract with a New York distributor calling for 800 trucks to be delivered within three years. The order calls for 200 trucks the first year and 300 each for the second and third years and totals about $1,500,000. The order includes the 1½, 2½, 3½-ton models. It is expected that this company will bid on the model A truck.

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October a Record Month for Standard Parts

CLEVELAND, Nov. 24—Production records in the standard parts plants here were broken in October, the output for this month being the largest in the history of the company, as well as the largest of several of the factory units. Much of this has been due to the rigid growth in the use of commercial cars, and this necessitated a large increase in the axle output. However, the greatest percentage of production is going through the regular channels.

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Gasoline Bought Through Coupons

DETROIT, Nov. 22—The Sinclair Oil Co. of Detroit and other cities is issuing gasoline and oil coupon books for the convenience of its customers. These cost $10 each and may be exchanged for $10 worth of gasoline or oil at any of the various company filling stations or at any garage or service station handling Sinclair oil.

Coal Cars for Buick Shipment

ST. LOUIS, MO., Nov. 26—The Vesper-Buick Auto Co. has unloaded 197 Buick automobiles here from 69 coal cars. This shipment was arranged recently by F. W. A. Vesper when, on a visit to the Buick factory at Flint, Mich., he learned that the company was receiving coal from southern Illinois mines. He obtained special permission from the coal transportation commission to load these cars for the home trip by pledging that they would be unloaded promptly in St. Louis and the cars sent at once to the mines. None of the cars could be sent to any other destination unless nearer the mines. The cars arrived here as two sections of a freight train.

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Los Angeles Show Extended 3 Days

LOS ANGELES, Nov. 23—During the first six days of the show here, 100,000 persons passed the ticket takers; so great was the interest in the show that it was extended 3 days.

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Change in Curtiss Aeroplane Address

GARDEN CITY, N. Y., Nov. 24—Because of the removal of the experimental, research and patent departments from the Curtiss Aeroplane & Motor Corp., Buffalo, to the Curtiss Engineering Corp., Garden City, all mail intended for Glenn H. Curtiss and for these departments should be addressed to the local concern.

Guernsey Will Aid in War Truck Work

WASHINGTON, Nov. 24—Charles Guernsey, chief engineer of the Service Motor Truck Co., Wabash, Ind., was called to Washington on Nov. 15 for at least 3 months, and will act as civilian expert, to aid in the production of Class A and AA motor trucks.

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Jerry W. DeCou has resigned as factory manager of the Smith Motor Truck Corp., Chicago. Mr. DeCou was for many years connected with the Thomas B. Jeffery Co., Kenosha, Wis. Besides being one of the leading automobile production experts of the country, he is an inventor of some note, being responsible, among other things, for the type of revolving gun turret that is being used by the hundreds on armored motor trucks in the European war zones. He will take up some private research work for a short time before again identifying himself with a prominent automobile, truck or tractor concern.

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J. P. Hunting has become special representative in charge of equipment sales of the General Asbestos & Rubber Co., Charleston, S. C. His headquarters will be in Cleveland, representing the company in the sale of Garco brake lining and other Garco products.

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V. H. Smith, of Cincinnati, formerly in charge of the service department of the Willys-Overland Co. in South Africa, has been appointed to the ordnance department of the United States Army, with the title of first lieutenant.

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E. G. Pierce, recently appointed consulting chemist by the Republic Motor Truck Co., Alma, Mich., has completed the equipment of a branch commercial laboratory in that city, which is under the direct supervision of C. S. Morgan.

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W. K. Swigert, superintendent of production at the Chalmers plant in Detroit, has resigned to take charge of the Nordyke & Marmon Liberty engine plant. H. M. Jerome, assistant engineer of the Chalmers company, has also resigned.

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Dr. Edward E. Pratt, recently chief of the Bureau of Foreign and Domestic Commerce, Washington, has been elected vice-president of the Pacific Commercial Co., New York.

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Clifford M. Snow on Nov. 1 succeeded Hal M. Harris as Southwestern division sales manager for the Selden Truck Sales Co., Rochester, N. Y. At the same time the division headquarters were removed from Atlanta, Ga., to Birmingham, Ala., where Mr. Snow will be located, supervising Selden dealers in Georgia, Florida, Alabama, Louisiana, Mississippi and Tennessee.

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J. C. Ayers has been elected vice-president and placed in general charge of sales and advertising of the Denby Motor Truck Co., Detroit.

Men of the Industry

Changes in Personnel and Position

A. H. Dewees, purchasing manager of the Saxon Motor Car Corp. for the past 2 years, has resigned. Mr. Dewees has not as yet announced his plans for the future.

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H. G. Benedict has become works manager of the Glenn L. Martin Co., Cleveland. Mr. Benedict was recently works manager of the Aeromarine Plane & Motor Co., Keyport, N. J., and formerly works manager and consulting engineer on factory management with several automobile and other manufacturers.

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W. C. Sherman has joined the sales forces of the Packard Motor Car Co., New York. He will be in the passenger car division.

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R. L. Grubb, formerly with the A. B. Ratbaker Rubber Co., has formed a company known as Grubb & Co., Wilmington, Del., which has established a tire shop at 905 Orange Street. The company has taken the agency for the Michelin tire.

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F. J. Durling has resigned from the Loveland Co., Detroit, and is now manager for the King-Cleveland Co., Cleveland, distributers for the King. He succeeds H. A. Mitchell, who goes into government service.

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J. F. Hangstefer, assistant service manager for the King Motor Car Co., has reported at Camp Custer, Mich., under draft service orders.

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John J. McDonough, Jr., has been appointed branch manager for the Kaehler Motor Co.'s Norfolk, Va., house, handling the King and Saxon.

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E. G. Shaw, general manager and vice-president of the B. F. Goodrich Co., is director of welfare and recreation for all Ohio troops, having been appointed by Governor Cox.

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E. F. Lepine is assistant director of purchases for the Continental Motors Corp. He was formerly in the purchasing department of the Chalmers Motor Co.

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W. A. Baxter, recently with the Maxfer Co., Chicago, will take charge of New York State, eastern Pennsylvania and New England for the Dart Motor Truck Co., Waterloo, Iowa. E. W. Brooks, formerly with the Available Motor Truck Co., will be a Dart district representative in Illinois, Indiana, Ohio and western Pennsylvania. S. B. Knudson will look after dealers in Iowa, Missouri, Kansas and Nebraska.

Gordon Heads Selden Truck Sales Co.

ROCHESTER, N. Y., Nov. 23—George C. Gordon has been re-elected president and treasurer of the Selden Truck Sales Co. Other officers include W. C. Barry, Jr., vice-president; E. B. Osborn, assistant treasurer; and R. H. Salmons, secretary. The directors elected are: G. C. Gordon, C. H. Stearns, H. G. Strong, W. C. Barry, Jr., and R. H. Salmons.

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E. D. Yount has been appointed local manager of the South Bend, Ind., depot of the B. F. Goodrich Co., replacing W. W. Vandeveer, who has been transferred to the Goodrich Sales School. J. W. Moore has been made local manager of the Fort Worth, Tex., depot. F. S. McNaul has been promoted to local manager of the Hutchinson, Kan., depot. W. J. Balaun has been advanced to the local managership of the Waco, Tex., depot. F. T. Reuter becomes local manager of the Oklahoma City depot. W. F. Burbank succeeds A. E. Lees of the San Diego depot. S. S. Clark assumes charge of the Salina, Kan., depot. T. B. Graham becomes operating manager of the Seattle branch, succeeding C. J. Pomeroy, who has entered the Government service.

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Frank L. Bowron of the New Way Motor Co. and Ross F. Bowron of the Olds Motor Works, Lansing, Mich., have entered the aviation service.

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Martin Carroll, of the Van Cortlandt Corp., New York distributor for Peerless cars and trucks, has been commissioned a first lieutenant in the Ordnance Department.

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A. J. Bechtel is manager of the Studebaker factory branch in Toledo and succeeds Charles E. Doan. For the past 2 years Mr. Bechtel has been assistant sales manager of the Studebaker Corp.

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L. F. Marshall is manager of the Toledo branch of the Fisk Rubber Co. He was formerly manager of the Cleveland branch.

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Howard L. Baxter, formerly assistant timekeeper and bookkeeper of the Reo Motor Car Co., has joined the aviation corps and Albert R. Miller is a wireless operator at the Great Lakes training station.

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E. E. Bell has been appointed manager of the used car department of the New York branch of the Studebaker Corp. He succeeds C. E. Ackerman, who will assume an executive post with the Studebaker Corp., in Los Angeles, Cal.

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Arthur Chevrolet, former race driver, has moved the service station for Rudge-Whitworth wire wheels in Indianapolis to 719 North Illinois Street.

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Charles Baasch is in charge of the New York office of the Blue Ribbon Body Co.

Goodyear Succeeds with Cotton from Arizona

NEW YORK, Nov. 23—The Goodyear Tire & Rubber Co. is supplying itself with long staple cotton grown on its land in the Salt River Valley of Arizona. The first crop of this tract is now being harvested.

Several years ago the company bought 26,000 acres of desert land near Phoenix and Mesa, Ariz., and after reclaiming a tract of 6000 acres, planted the finest grade of Egyptian cotton. The threatened shortage of cotton from Egypt, due to the disturbance in transportation, and the ravages of the boll weevil on its crops of Sea Island cotton in the United States, caused the company to guard itself and to look elsewhere for the supply. Plans are under way for the planting of 14,000 additional acres next spring, so that fully 20,000 acres will be under cultivation next season.

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Samson Tractor Production Starts Jan. 1

PONTIAC, MICH., Nov. 23—The Samson Farm Tractor which is manufactured by the General Motors Truck Co. will not be in production until about Jan. 1 though several machines have been completed and are at present operating in the vicinity. The original Samson tractor was manufactured by the Samson Tractor Co., Stockton, Cal., for a number of years and the entire business was taken over by the General Motors Truck Co. Though the executive office has been moved to Pontiac, the California plant is being operated and will continue to supply tractors to the western coast, and the Pontiac factory to supply the Middle West.

This tractor is of the three-wheel type, the third wheel being in the center and front and used for steering. The wheels have an 18 in. tread and a power pulley is provided for the operation of stationary farm machinery. Though the price has not been definitely determined it is expected that it will be about $1,750.

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Eagle Awards Contracts

APPLETON, WIS., Nov. 26—The Eagle Mfg. Co., which recently increased its capital stock from $200,000 to $500,000 to develop its tractor business, has awarded contracts for the erection of a new shop building, 120 by 120 ft., which will be devoted to the production of tractors. The new shop will be ready in 60 to 70 days. The company has a large volume of unfilled orders for tractors on its books, both for domestic and foreign delivery.

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Harley-Davidson to Increase

MILWAUKEE, WIS., Nov. 26—The Harley-Davidson Motor Co., one of the largest builders of motorcycles, light trucks, and military vehicles, has awarded contracts for the erection of another large shop addition, made necessary by the demands upon its facilities, long overcrowded. The new shop will be 120 by 180 ft. in size and will be located at its main works at Thirty-eighth and Chestnut Streets, Milwaukee. Construction work began to-day and will be completed about Jan. 1 or 15.

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Current News of Factories

Notes of New Plants—Old Ones Enlarged

Milwaukee Forge Breaks Ground

MILWAUKEE, WIS., Nov. 26—The Milwaukee Forge & Machine Co., 220-224 Lake Street, has broken ground for a complete new manufacturing group at Oklahoma Avenue and the C. & N.-W. R. R. tracks at the southern limits of Milwaukee. The forge shop will be 75 by 135 ft. in size, and the machine shop 65 by 120 ft. The total investment will be about $65,000. The plant will be ready shortly after Jan. 1.

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Lawson Aircraft in New Plant

GREEN BAY, WIS., Nov. 24—The Lawson Aircraft Corp. to-day moved into its new airplane manufacturing plant here, a reinforced concrete building, 100 by 150 ft., two and three stories high, designed especially for the purpose. For 6 months or more the company has operated in leased quarters, which will be continued as auxiliary facilities. The company is working on large orders for military instruction craft, which are built in two types of military tractor biplanes. Type M. T. 1 is known as a primary training machine for novices and the speed range is from 37 to 78 m.p.h. Type M. T. 2 is an advanced type of training machine, with speeds of 40 to 90 m.p.h., which also can be used for reconnoitering. A third type with a maximum speed of 175 m.p.h. will be developed at once with the new facilities available. Eventually a fourth model, or battleplane, will be brought out. Several machines already have been delivered to the Government, and others are in process of construction or undergoing field tests.

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Federal Truck to Add $45,000 Building

DETROIT, Nov. 23—The Federal Motor Truck Co. is to construct a two-story brick and steel factory 95 by 308 by 34 ft. at the right of its present factory building. This will be located between Military Street and the railroad and will cost approximately $45,000.

This is a continuation of the general expansion that has been made in the past year to care for increased production. Recently a large addition was built for office purposes and upon completion was immediately turned over to production. Although it has not been definitely announced it is expected that a large part of the new factory will be used for the Government work, as this company is working on Class B trucks.

Rowe Truck Factory for Lancaster

DOWNINGTON, PA., Nov. 23—The Rowe Motor Mfg. Co. has purchased a large tract of land along the Pennsylvania Railroad at Lancaster, where a factory is under construction. It is expected this plant will be in operation by Jan. 5. The output is expected to be increased 200 per cent.

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New Lapeer Factory Work Soon

LAPEER, MICH., Nov. 22—Some time ago the Lapeer Tractor Truck Co. purchased 8 acres of land for the purpose of erecting a factory. It is expected that the work on this factory will be started in the near future.

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Owen Tire to Build

BEDFORD, OHIO, Nov. 24—The Owen Tire & Rubber Co. is having plans prepared for a factory to cost $800,000.

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Sheldon Axle Adds

WILKES-BARRE, PA., Nov. 24 — The Sheldon Axle & Spring Co. will build a two-story extension to its axle department, 60 by 200 ft.

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Stanley Steamer Builds

NEWTON, MASS., Nov. 24—The Stanley Motor Carriage Co. has let contracts for a wood and terra cotta, two-story, 64 by 100-ft. factory.

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Standard Parts Plant Managers Convene

CLEVELAND, Nov. 24 — Plant managers of the Standard Parts Co. held a convention here this week. About fifty representatives were present and the properties of the three Cleveland plants were inspected. Production plans and co-operative methods for the coming year were discussed, and at a dinner in the Hotel Statler it was announced that the October output of the Standard Parts Co. was the largest in its history.

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Radiator Service Adds to Scope

PROVIDENCE, Nov. 23—The Radiator Service Co. has purchased the radiator department of the Metallic Shell & Tube Co. including all stock and machinery. The company will manufacture American radiators for the trade in addition to rebuilding and repairing all makes of radiators.

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Cleveland Millings Lists Milling Cutters

CLEVELAND, Nov. 23—The Cleveland Milling Mach. Co. is sending out semi-monthly, a list of stock milling cutters for immediate delivery.

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Taylor Truck May Manufacture in Old Burford Plant

FREMONT, OHIO, Nov. 23—The Taylor Motor Truck Co. may continue to manufacture trucks in the old Burford plant, according to an order by Federal Judge

Killits to W. W. Morrison, president of the Continental Trust & Savings Bank, Toledo, trustee of the bankrupt Burford company. The court commands the trustee to turn the property over to the Taylor Motor Truck Co. as soon as an inventory is completed. Morrison is ordered to place all operations in the factory under observation and all business transacted by the company must be accounted for.

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Comet Plant Ready Dec. 15

DECATUR, ILL., Nov. 26—The first unit of the factory of the Comet Automobile Co., 150 by 600, will be ready for occupancy Dec. 15.

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$100,000 Addition for Ecorse

DETROIT, Nov. 26—The Ecorse Foundry & Machine Co. has purchased 7 acres of land adjacent to its original plot of 8 acres and will construct a factory addition to cost approximately $100,000. The first two units of the new plant have been under construction since early in October and are now ready for the roof. The additions to these buildings are 30 by 50 ft. and 100 by 60 ft. respectively.

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Victor Seats on Market

NEW YORK, Nov. 24—The American Auto Top Companies is now manufacturing the Victor disappearing chair at its Morristown, N. J., plant. This chair is adaptable for all six or seven-passenger sedans, limousines and touring cars, and folds up in back of the driver's seat. The company is also manufacturing a disappearing auxiliary chair with arm rests which can be folded out of the way. The seats for touring cars are built to conform to any curve of the body. The offices are at 1 Hudson Street, New York.

Firestone Entertains Rubber Assn. Directors

AKRON, OHIO, Nov. 22—H. S. Firestone, president of the Firestone Tire & Rubber Co., entertained the directors of the Rubber Association of America and standing committees that have served with him during the past 2 years. Thirty-five were present from the East and inspected the rim and rubber plants of the company. The relation of finance to the rubber industry was discussed.

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Sebring Tire to Increase Capacity

ALLIANCE, OHIO, Nov. 22—Two new buildings and an addition to the main building will be erected by the Sebring Tire & Rubber Co. to increase the capacity of the plant from 150 to 500 tires a day. It is expected that these buildings will be completed by Feb. 1.

Calendar

ASSOCIATIONS

1918

Jan. 3-4—New York Automotive Electric Assn. meeting.
Jan. 7-8—New York, National Automobile Dealers' Assn. directors' meeting with vice-presidents from Eastern States.

SHOWS

1917

Dec. 3-8—Akron, O., Akron Auto Show Assn., Auditorium Armory. O. G. Armstrong, Mgr.
Dec. 5-15 — Toledo, National Farmers' Exhibition at Terminal Auditorium.

1918

January — Kalamazoo, Mich., Kalamazoo Automobile Dealers' Assn., Armory.
Jan. 2-9—New York, Salon. Automobile Salon, Inc., Astor Ballroom. John R. Eustis, Mgr.
Jan. 5-12 — New York Show, Grand Central Palace, National Automobile Chamber of Commerce.
Jan. 11-19 — Philadelphia, 17th Annual Show, Philadelphia Auto Trade Assn., Commercial Museum Bldg.
Jan. 11-19—Providence, R. I., R. I. Licensed Auto. Dealers' Assn., State Armory. Percival S. Clark, Mgr.
Jan. 14-19—Rochester, N. Y., Tenth Annual Exposition Park. C. A. Simmons, Mgr.
Jan. 16-27 — Milwaukee, Wis., Milwaukee Automobile Dealers, Inc., Auditorium. (First 7 days, passenger cars; last 3 days, commercial cars.) Bart J. Huddle, Mgr.
Jan. 19-26—Detroit Automobile Dealers' Assn., Overland Bldg. H. H. Shuart, Mgr.
Jan. 19-26 — New York Motor Boat Show, Grand Central Palace, National Assn. of Engine and Boat Manufacturers.
Jan. 19-26—Detroit, Willis Avenue Overland Service Station.
Jan. 19-27 — Cleveland, Seventeenth Annual, Cleveland Automobile Show Co., Wigmore Coliseum. Fred. H. Caley, Mgr.
Jan. 19-28—Montreal, Can., Montreal Automobile Trade Assn., Ltd., Almy Bldg. T. C. Kirby, Mgr.
Jan. 21-26—Manchester, N. H., Academy. Couture Bros.,
Jan. 21-26—Scranton, Pa., Scranton Motor Trades Assn., Armory. Hugh B. Andrews, Mgr.
Jan. 21-26—York, Pa., Queen Street Tabernacle, York Automobile Dealers' Assn.
Jan. 21-26 — Wilmington, Del., Hotel Du Pont.
Jan. 23-28—Allentown, Pa., Lehigh Auto. Trade Assn., Traylor Motor Co.'s Garage. P. W. Leisering, Publicity Mgr.
Jan. 26-Feb. 2 — Chicago National Show, Coliseum and Armory, National Automobile Chamber of Commerce.
Jan. 26-Feb. 2—Chicago, Salon, Elizabeth Room of Congress Hotel.
Jan. 26-Feb. 2—Harrisburg Pa., Capital City Motor Dealers' Assn. J. Clyde Myton, Mgr.
Jan. 28-Feb. 2—Buffalo, N. Y., Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 26-Feb. 2—Bridgeton, N. J., Bridgeton Auto Dealers' Assn. O. P. Riley, Sec.
February — Greensburg, Pa., Westmoreland Automobile Dealers' Association.
February — Peoria, Ill., Peoria Auto and Accessories Dealers' Assn. W. O. Ireland, Mgr.
Feb. 9-16—Bronx, N. Y., 2d Battery Armory, Bronx Automobile Dealers' Assn. D. J. Barrett, Mgr.
Feb. 11—Toledo, Terminal Auditorium, Toledo Auto Show Co.
Feb. 11-16—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Mgr.
Feb. 11-16—Kansas City, Mo., Third Annual National Tractor Show.
Feb. 16-23—New York, Second Pan-American Aeronautic Exposition, Grand Central Palace and Madison Square Garden.
Feb. 16-24—San Francisco, Cal., San Francisco Dealers' Assn., Exposition Auditorium. G. A. Wahlgreen, Mgr.
Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building. Ernest T. Conlon, Mgr.
Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G. First Regiment Armory. Claude E. Holgate, Mgr.
Feb. 18-23—Des Moines, Ia., Des Moines Automobile Dealers' Assn., Coliseum. C. G. Van Vliet & Dean Schooler, Mgrs.
Feb. 18-23 — Springfield, Ohio, Springfield Auto Trades Assn., Memorial Hall. C. S. Burke, Mgr.
Feb. 18-23 — Waterbury Conn., United Shows Co.
Feb. 18-24—Des Moines, Ia., Second Annual Truck, Auditorium. Dean Schooler & C. G. Van Vliet, Mgrs.
Feb. 18-25 — Pittsfield, Mass., State Guard, State Armory. James J. Callaghan, Mgr.
Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23; trucks 25-27), Coliseum. J. L. Elliott, Mgr.
Feb. 22-Mar. 9—Brooklyn, N. Y., Brooklyn Motor Vehicle Dealers' Assn., Twenty-third Regiment Armory. I. C. Kirkham, Treas.
Feb. 25 - Mar. 2 — Bridgeport, Conn., Fourth Regiment Conn. Home Guard, State Armory & Casino. B. B. Steiber, Mgr.
Feb. 27-Mar. 6 — Boston, Mass., Salon, Boston Automobile Dealers' Assn., Copley Plaza Hotel. Chester I. Campbell, Mgr.
Mar. 1—Lyons, France, Third Sample Fair.
Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh, Motor Square Garden. John J. Bell, Mgr.
Mar. 19-24—San Francisco, Cal., Motor Truck Dealers of San Francisco, Auditorium. Ivan R. Gates.
Mar. 19-24 — Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.
Apr. 9-13—Stockton, Cal., San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.
Sept. 23-28 — Chicago, National Accessory Show for Fords. Coliseum.

S. A. E.

Dec. 5—Buffalo Section at Statler Hotel.
Dec. 5—Tractor Standards Committee Meeting at Minneapolis Section offices.
Jan. 10—New York, Automotive Dinner at Hotel Biltmore.
Feb. 1—Chicago, War Dinner during Winter Meeting.

Engineering

American Railway Master Mechanics' Assn.
American Institute of Electrical Engineers.
Master Builders' Assn.
American Society of Heating and Ventilating Engineers.
Association Iron and Steel Electrical Engineers.
Mining and Metallurgical Society of America.
Society of Automotive Engineers.
Illuminating Engineering Society.
National Electric Light Assn.
National Gas Engine Assn.
American Society for Testing Materials.
American Institute of Metals.
American Foundrymen's Assn.
Society Naval Architecture and Marine Engineers.

DECEMBER

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
20—Mining & Met. Soc. Amer. Monthly meeting New York section at Engrs. Club.